The TECHNOLOGY DEPARTMENT

CHEMICAL AGE

VOL LIX 25 SEPTEMBER 1948 No 1524

INDEX TO ADVERTISERS
IN THIS ISSUE

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1st to handle an efficient domestic distribution of their products

2nd to promote the exportation of their products.

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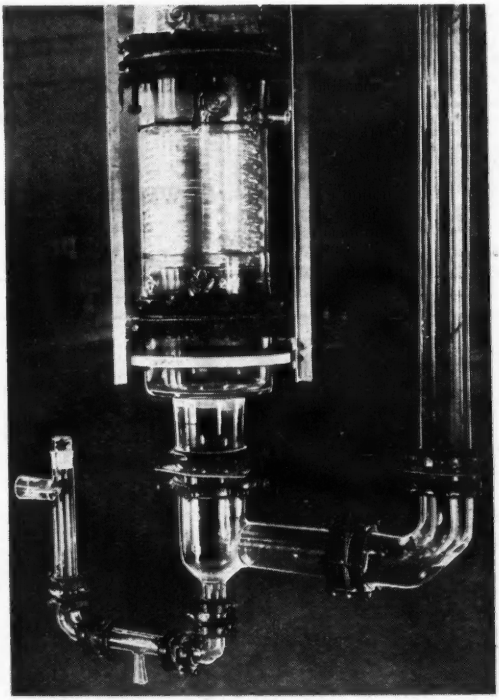

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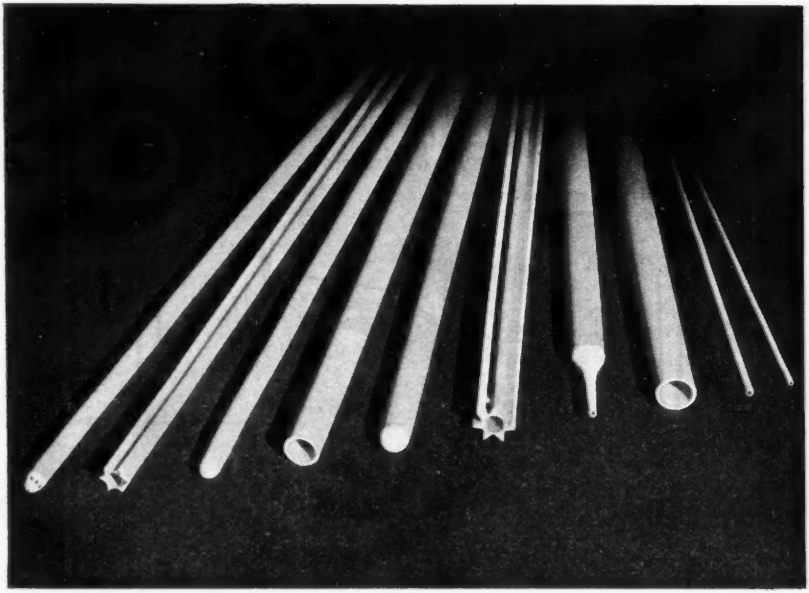

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In Search of Energy

IT is self-evident that the world now needs higher production of almost everything. There are chemical methods of increasing rates of reaction, which (if we exclude certain physical factors such as temperature and pressure) resolve themselves into the use of catalysts. There may, too, be moral "catalysts" which will resolve the stubborn problem of getting more work done, but it is highly doubtful if there is any moral agency that will enable even the most tireless worker to produce double his output in a given time. There is only one way to do that, and that is by increasing the power at his disposal. That implies a fuller use of energy derived from outside sources, of which the most abundant still is coal. Tomorrow it may be power derived from the atom, but for the moment, it is sufficient to think of coal and the next step after coal.

The oil supplies of the world are being worked out at an uncomfortably rapid rate. The U.S.A. is thought to have sufficient only to last her for not more than two or three decades, and the other sources of oil in the world are not inexhaustible. Oil and natural gas are at the same time the promising storehouse of raw materials for an expanding chemical industry, as well as being a very important source of the energy required to maintain nearly all the processes. The immediate evidence is that coal deposits, too, will suffer the fate of the oil reserves in a measurable space of time. Whence, then, shall we get our supplies of carbon?

Dr. Levinstein has answered, in principle, "from the new developments that may be expected from organic chemistry." Carbon dioxide and methane, he points out, are not only our two basic raw materials but they are also the beginning and the end products respectively of the complex cycle that living matter undergoes. The experiments conducted by the late Prof. Baly at Liverpool on the conversion of carbon dioxide to formaldehyde and sugars, while not successful on any practical scale, propound a problem of great technical interest that, in Dr. Levinstein's view, "in another generation or less may be a vital matter. It is a problem to be tackled now with adequate means in the laboratory." It would yield energy in the form of food by chemical processes that now take place only slowly through the agency of plants. To no country would it be so important as to Britain, having relatively a large population and few acres. Here, it would seem, is a problem of energy that deserves the unstinted attention of chemists, predominantly by those in a Government laboratory or the Universities. The first step must be an advance in the pure chemistry of the subject.

Problems of coal production and availability must be left to the experts in mining and fuel technology. The physicist will have much to say about the replacement of

On Other Pages

coal by other forms of energy, if coal becomes either too scarce or too expensive. In the U.S.A. research into atomic energy problems is being pursued with enthusiasm and almost without regard to expenditure. In some respects American discoveries are shared with us, but how far that co-operation extends few are able to say. Other countries are engaged in the search, and it is unthinkable that so great an expenditure of effort will not eventually bring beneficial results. It is inevitable that atomic research should be pursued primarily by Governments, private individuals not having the necessary funds to purchase and fabricate the huge equipment, but it is none the less unfortunate that here the Government is in control. The salaries paid at Harwell, according to the information published recently, are on a Civil Service scale, and are inadequate to attract and keep the best men. Senior scientific officers, we are told, possessing a 1st or 2nd class honours degree and at least three years post-graduate experience, get £620 to £810 a year. That does not sound to be the scale on which to generate energy, atomic or of the commoner kind.

The search for uranium, too, is employing many geologists and others, but none is yet in a position to say whether there will be enough uranium to go round for many years. Means for extracting uranium from poor ores seem the most hopeful line of research at the moment. In South Africa, the interesting discovery has been made that uranium is associated with gold-bearing rocks. Uranium production is State-controlled, and the State is co-operating with the gold-mining companies to secure the residual uraniferous material. Extraction is difficult, but so was the extraction of gold until the cyanide process was discovered.

So, all over the world, the search for energy goes on. Some are seeking new means of using energy, or ways of increasing output a manshift by employing more energy. Others are seeking to make available energy adequate by using it more efficiently, while a few hope to reveal new sources of energy. We have to face many problems, but that of energy is perhaps the most widespread and important of all.

Marshall Plan Surveyed

Ernest Benn, Ltd., will publish on October 4, a pamphlet entitled "The Meaning of the Marshall Plan," by Sir Arthur Salter, M.P. After giving a concise outline of the plan and what it replaces, the author discusses America's motives and the next steps to be taken on this side of the Atlantic. In a concluding section the reader is given a clear idea of the situation that is likely to face this country when the Marshall Plan expires in 1952.

NOTES AND COMMENTS

The New "Incentive"

THE selection by the President of the Board of Trade of the increases in chemical production to lend point to his arguments in the House of Commons last week in support of the Government's economic programme will seem to some to have been in the nature of an afterthought. To those who have followed the subject consistently it is a commonplace that what chemical industry is doing is seldom cited as evidence, regardless of the very healthy expansion which has taken place since the ending of the fuel crisis of 1947 made development feasible, and of the increasingly large proportion of overseas earnings derived from the products of our chemical plants. The 19 per cent export increase achieved by chemical industry in the second quarter of this year compared with the same quarter a year ago has now been officially recognised by Mr. Harold Wilson as ranking among the "really remarkable achievements." The belated acknowledgment would convey a good deal more satisfaction if the speaker and those who support him were prepared to admit the real sources of those improvements, which are very gradually permitting a slightly more hopeful outlook on the general picture of national earning-power and indebtedness. According to Mr. Wilson, the stimulation of export trade to reach (in July last) 149 per cent of the 1938 volume is due to "what the Government has done to provide markets." So far as chemicals are concerned, that explanation is about as unreal as Mr. Wilson's earlier implication that the splendid record of increasing iron and steel production over many months is somehow associated with the approach of nationalisation.

Another Silent Service?

SIR ROBERT WATSON-WATT, invited last week to open the exhibition provided by the Oxford branch of the Association of Scientific Workers, initiated at the same time something of very much wider import—by his somewhat minatory reference to what, in his view, represents the duty of scientists as a whole to the rest of the community. His doctrine is that there must be a fundamental change in the relationship between scientists and the public, and unless scientists themselves promote a mutual interchange "of thought and understanding" between the scientific worker and the "consumers," on the intellectual or the material plane, it will be the worse for the scientists. He is reported as having indicated that some of that trouble would come from the political sphere. The effect of that declaration is unfortunate because it conveys—perhaps unwittingly—the flavour of scientific enterprise subordinated to "the will of the people," and that philosophy is reported to have produced some ludicrous and rather nauseating results in the Soviet science world. That impression is all the more regrettable because his theme the need of better liaison and understanding is one to which all scientists who have had the leisure to think at all about it would probably subscribe.

American Method

FEW laboratory workers will see much prospect of fruitful results of a sort of "shotgun wedding" between scientists and the rest. Prudence and charity both suggest that Sir Robert had not that in mind. There are, of course, other ways of acquainting the public with the benefits they receive from the work being done in the laboratories. The most active exponents of that policy are the organised chemists of the U.S.A., who are responsible for a general news service in "tablet" form. This, for palates accustomed to news in highly concentrated and well coloured doses, is probably better than the relatively meagre intellectual rations provided for general consumption here. It has, however, all the characteristics of an indigenous American growth which would not survive transplanting. Meanwhile, science news in the general Press in this country is better and more fully reported than ever before. It is, even so, a good deal short of what the tempo of events justifies. Given a lot more newsprint and a little more collaboration from the scientific workers themselves, all but a very small minority of national and provincial newspapers could be trusted to bridge all those chasms which may seem to divide the scientist from others, whenever the intelligible communication of ideas is feasible.

Science in a Strait-Jacket

THE closer relationship between political forces and the scientist has been raised, not inopportunely, in another place by Mr. George V. Allen, U.S. Assistant Secretary of State for Public Affairs, discussing the progress of science and the dissemination of scientific knowledge at a meeting of the American Association for the Advancement of Science. He said he gloried in the criticism of any violation of academic freedom which occurs in the U.S.A. On the international plane, he said, science had in some places fallen a victim to Communism's strait-jacket. That, as he pointed out, is not peculiarly a phenomenon of this century. "The pages of history are full of the names of the martyrs of science who have suffered persecution because of their steadfast adherence to evidence as revealed through their experiments. . . . To-day the long-suffering scientists of Moscow are forbidden to reach their own conclusions on the teachings of Mendel or Lamarck," said Mr. Allen.

Health and Work

THE closing session, on September 17, of the Ninth International Congress in London on Industrial Medicine, left no doubt about the great improvements which have been made in recent times in working conditions in industrial plants in Britain. The Rt. Hon. Lord Webb-Johnson (president of the Royal College of Surgeons), who has witnessed so many of these advances, is still acutely aware of what still remains to be done to protect the health of employees, especially those engaged in dangerous sections of industry, the manufacture of certain chemicals and—a more recent challenge—work involving close proximity with radioactive substances. He believes more in preventive measures, which clearly deserve more attention even than remedial work, admirable as are some of the aids to convalescence afforded by industrial organisation. Lord Webb-Johnson presented a picture of working conditions in, for example, potteries, a few decades ago when, in his youth, he first realised the evils that existed in industrial plants, such as exposure to the risk of poisoning, about which very little was done in those days. Those bad old conditions had gone, he said, very largely because of the work of the pioneers. If such phenomenal advances have been made in one lifetime, what vastly improved conditions may be looked for in the future in the more enlightened co-operation which is now fostered alike by modern ethics and technology?

Thermal Economy

WHATEVER hard words the heavy industries have cast at the Ministry of Fuel and Power in respect of past demeanours and misleading advice, only the vindictive can withhold respectful recognition of the sound practical aid which that department has rendered since its Fuel Efficiency Committee published Fuel Efficiency Bulletin No. 1 (Steam Production and Consumption) in the series of which No. 51 just issued, is a specially apposite addition. The cynic may observe that the circumstances which make this bulletin—on the economies of fuel and finance to be secured by "Heat and Power Linkage"—have reached a peak under the administration of the same Ministry, but that does not minimise the value of the essentially practical evidence marshalled in the pamphlet of how the sharing principle can be extended to enable the heat and power needs of neighbouring plants, not necessarily in the same industrial category or contiguous, to be supplied from one source. The advantages are self-evident and are magnified by the present high costs and uncertainties of power production, which exercise a ruling influence in determining the practicability of many contemporary projects. Best of all, this is far from being a collation of theories, consisting, as it does, very largely of concrete instances of how the superabundance of one plant's heat producer can be utilised by "steam linkage," or the piping of hot water, with suitable insulation, to supply another's needs, recouping a good part of its own costs in the process. Coke ovens and blast furnaces are conspicuous targets for this form of conservation, which is, of course, not confined to the high- or low-grade heat. The better use of by-product gases and economical production and distribution of electrical power by collaboration among contiguous groups are capable of being expanded far beyond the scope of present uses, the basic facts and figures of some of which are presented now.

The Widening Field for Phosphorus

Fresh Adaptations for U.S. Industry

FOURTEEN additional phosphorus chemicals, seven of which are already being produced in commercial quantities, while the others are in the state of works or in laboratory development, have been developed by the Victor Chemical Works, New York, and will be available this autumn, the company announced last week. Of the 14 chemicals, 12 are organic phosphorus compounds, and indicate the emphasis now being placed on organic phosphorus chemistry by the company's research group.

The experimental study of the preparation of the phosphorus-containing insecticides has led to the availability for commercial use of several technical chemicals which are suitable as intermediates for organic synthesis. These include the dialkyl phosphoric acids which are reactive substances, soluble in organic solvents and which are useful for the introduction of phosphorus into many complex organic compounds. Exhaustive study of the alkyl phosphoric acids has led to the discovery of a group of surface-active compounds which have been found to be suitable for use as wetting agents and detergents.

Several of these compounds are already in commercial production, and are being employed for a variety of purposes. One is a phosphorus-containing detergent of the nonionic type which possesses a very high cleansing power, particularly when formulated with a complex phosphate builder. This product, being a very low foamer, is especially valuable for commercial laundry use.

Another unusual application of the same class of compounds was developed because of the necessity for increasing the light stability of transparent films. Several of Victor's alkyl phosphates are now used as stabilisers for vinyl plastic films, in the manufacture of table tops, raincoats, upholstery covers and similar articles.

Rapid Curing Plastic

Among the company's accomplishments in the organic field is the development of an organic phosphorus-containing plastic known as Phoresin. Continued efforts to improve the commercial possibilities of this plastic have resulted in the production of materials which can be cured in a matter of minutes, instead of several hours.

In addition, this research has resulted in the development of methods suitable for the manufacture of several intermediate chemicals including benzene phosphorus dichloride, benzene phosphoric acid. Several interesting commercial outlets for these chemicals have already been developed.

Facilities for Industrial Studies in Japan

FULLER facilities for the study of technical and industrial processes developed in Japan before the end of hostilities have been made available as a result of a decision taken by the Far Eastern Commission in Washington. The new measures, which are additional to the provision represented by the technical reports already compiled by the Allied information services, have effect from July 1 this year until March 31, 1949.

During that period, states the *Board of Trade Journal*, the commission's ruling is that "technical representatives of the Governments of members of the Far Eastern Commission should be permitted access to and the right to take copies of the details of any technical or scientific processes of industrial or commercial value which are of Japanese origin and ownership, and which were developed prior to December 31, 1945.

Technical or scientific information obtained by any representative of the Government of a member of the Far Eastern Commission pursuant to this policy statement should be promptly and fully displosed to the Supreme Commander for the Allied Powers for dissemination to other interested members of the Far Eastern Commission upon specific request."

Representatives allowed to enter Japan under this scheme will be restricted to a small number by the Supreme Commander for the Allied Powers. In view of this and the fact that the operative date for the beginning of the scheme was July 1, interested firms are asked to apply as soon as possible to Export Promotion Department, Thames House North, Millbank, London, S.W.1, for further particulars.

Italian Chemical Employment.—According to the latest statistics, only 14.1 per cent of workers in Italian chemical industry are unemployed. This compares very favourably with other industries (building industry 45.6 per cent, woodworking 42.8 per cent, mining 25.07 per cent).

French Potash Discoveries

Prospects of Petroleum

THE discovery, in Les Landes (France), of formations which appear to be fairly rich in potassium salts, and also offer indications of petroleum, is described by V. Charrin in a recent issue of *Chimie et Industrie*. Potash discoveries in this region, notably at Boudigot, had, in fact, been announced in 1937, but little was done until the war stimulated development work.

Galleries were opened at depths of 200 to 400 m. and then at 635 m. Deposits at between 200 and 400 m. depth were estimated at about 800,000 tons, and 40,000 tons of ore of 12 per cent pure potash were produced. At the lower depth (400 m.) richer ores were found of 18-22 per cent potash, and sometimes up to 30-32 per cent. It is suggested that additional shafts should be sunk to these lower levels and beyond, especially as there is a possibility of petroleum, despite the fact that many soundings already made in Les Landes and the Basses-Pyrénées had proved negative, even at considerable depth.

Geological Evidence

Without taking into account the fact that the Pyrenean trias may be locally petroliferous, there is a very close analogy between the Stassfurt potash formations, below which petroleum sands were found, and those of Boudigot. The analogy is not, of course quite complete, for in Les Landes the geological age is undoubtedly triassic, while at Stassfurt it is permian, but this difference is not regarded as material, for other geological factors are more pertinent and in favour of the petroleum theory.

Potash deposits both on the Spanish and the French sides of the Pyrenees have, as is well known, proved of considerable interest during many years past. On the Spanish side they have been exploited at Surria and Cardona, and indications were also discovered at Pampelune.

On the French side indications have been found in various districts, notably at Salles-de-Béarn, Castagnède, and at Oraas. A sample ore from the latter district obtained at 500 m. gave, on analysis, hydrated magnesium chloride 42.8 per cent, potassium chloride 24 per cent, sulphuric acid 19.3 per cent.

Reference is also made to the so-called hippodrome of Peyrehorade where fairly rich potash deposits—syvinite and potassium chloride—were found in 1927-8 between 450 and 482 m. These discoveries are said to have been made in the search for petroleum, and as this latter proved negative, like a great many others in France, the potash was then practically ignored.

Spanish Chemical Expansion

Many Building Projects Authorised

THE number of applications for permits to build new factories or to extend indicate that the Spanish chemical industries are in a rapidly expanding and progressive condition. Although by no means all applications received by the various Juntas are granted, during the half-year ended June 30, 1948, no less than 318 new factories and 132 extensions were authorised. Details are given in ION for July, and some of the principal may be tabulated as follows:—

	New factories		Extensions	
Acids, salts and other inorganic chemicals		54		14
Lyes and alkalis	12		6	
Detergents	7			
Caustic soda	4		1	
Metalloids, gases, and electro-chemistry		50		18
Ice	31		14	
Phosphates	2			
Fertilisers		13		4
Miscellaneous	6		3	
Ammonium chloride	3			
Organic, miscellaneous		6		2
Distillation		6		5
Amyl and ethyl acetates	2		1	
Pharmaceutical		28		25
Insecticides	5		2	
General	18		20	
Adhesives		10		7
Plastics		42		3
Moulding materials	31			
Synthetic resins	9		3	
Rubber		41		25
Reclaiming and vulcanising	34		12	
Perfumery		35		
Dyes		20		1

INDIAN N-F METAL POLICY

PROTECTION for the non-ferrous metals industry for three years is favoured in the report of the Indian Tariff Board accepted by the Government of India.

Among the primary metals dealt with, copper is regarded as most important and the board's main recommendation was that unwrought copper, copper scrap, lead ingots, lead scrap, zinc ingots, slabs, blocks or bars and zinc scrap should continue to be free of import duty. The duty on tin, tin scrap and tin plate scrap, nickel and nickel scrap, cobalt, chromium, tungsten, magnesium, muzak and scrap of all other non-ferrous metals and alloys should be removed.

A protective duty to remain effective until March 31, 1950, should be levied on brass ingots; zinc and lead sheets; yellow metal alloys, other than brass, tin solder; other white metal alloys type metal, nickel alloys, brass sheets, etc.

EUROPE'S CHEMICALS UNDER ERP

New Opportunities Opened by Marshall Aid

NOW that provisional agreement has been reached on the distribution of Marshall Aid among the countries participating in European Economic Co-operation under the terms of the European Recovery Act, it may be opportune to try to estimate the effect of U.S. assistance grants and loans combined with mutual help among the recipient states on chemical products.

Some raw materials for the manufacture of chemicals and chemical fertilisers are among the commodities which have been allocated to OEEC countries, and U.S. stock-piling of strategic commodities made available by participating states will also include some materials of chemical interest. Marshall Aid funds, however, will not, as far as can be seen at present, be used to an appreciable extent for the purchase or supply of chemical manufactures as distinct from basic materials used in chemical processes. Any expansion in the demand for finished or semi-finished chemical products therefore depends on the stimulation of economic activity in OEEC countries and commercial intercourse between them by the influx of U.S. aid.

Chemical Exchanges

There appear to exist considerable opportunities for an intensification of chemical exchanges among the states participating in European Economic Co-operation. Before the war, OEEC countries (including Germany) supplied two-thirds of all chemicals and allied products crossing national frontiers anywhere in the world, and the same group of countries absorbed more than two-fifths of all chemicals entering international trade. Despite the steady expansion of chemical requirements in overseas countries, a substantial proportion of the world trade in chemicals took place within a comparatively small area of North-West Europe, and from this area was also supplied the bulk of the chemical products imported into eastern Europe, the British Empire and the western hemisphere.

War and post-war changes have seriously affected the position of North-West Europe as the chemical workshop of the world. Chemical exports from the U.S.A. at least doubled in volume between 1937 and 1946. Last year U.S. chemical exports increased further by more than half in value to $783,000,000, and the export figures for the early months of this year indicated a further advance.

It is by no means impossible that the U.S.A. will export this year an amount of chemical and allied products equivalent in terms of sterling to the total world export trade in chemicals in one of the best pre-war years. The expansion of Canada's chemical exports has been similarly impressive. The North American continent thus bids fair to usurp Western Europe's position as chief exporter of chemical products.

Contraction of Exports

In Europe, war and post-war influences have had a twofold effect on foreign trade in chemicals. Most Continental countries have witnessed a shrinkage in the volume of chemical trade as a whole, and this decline has generally been more marked on the export side than for imports. Between 1938 and 1946 French chemical imports increased from 1,311,790,000 francs to 9,229,150,000 francs, and her exports from 2,904,420,000 to 12,472,270,000 francs. In 1947 imports rose to 11,390,490,000 and exports to 20,499,950,000 francs. All these figures, of course, are distorted by currency devaluations. In January-May, 1948, France imported 6,390,860,000 francs' worth of chemicals (against 4,323,070,000 francs in January-May, 1947) and exported 12,715,970,000 (8,857,930,000) francs of chemicals. If allowance is made for price changes, it would appear that France's chemical imports are now, perhaps, one-quarter below the pre-war volume; her export trade in chemicals fared rather worse. The position would no doubt have been even less satisfactory but for the latest currency devaluation.

Dutch Imports

The Netherlands import trade in chemicals increased from 137,394,000 florins in 1938 to 252,700,000 in 1946 and 401,700,000 florins in 1947, while Dutch chemical exports fell from 105,469,000 florins in 1938 to 71,700,500 in 1946 and recovered to 191,900,000 in 1947. This year Dutch imports and exports in January-April included 104,857,000 and 58,513,000 florins of chemicals. In volume chemical imports into Holland are still below the pre-war level, and Dutch chemical exports are, of course, far below the pre-war volume.

Belgium fared much better than her two neighbours. Chemical imports rose from 857,844,000 francs in the average of 1936-38 to 2,219,614,000 francs in 1946 and 3,193,105 francs in 1947, while Belgian exports of chemicals rose from 1,456,032,000 francs in

1936-38 to 2,348,906,000 in 1946 and 5,488,812,000 francs in 1947.

Her chemical imports have thus already surpassed the pre-war volume, and Belgium's chemical export trade showed a remarkable recovery last year. In January-May of this year Belgian chemical imports and exports rose further—to 1,773,974,000 francs (compared with 1,227,303,000 francs in January-May, 1947, and 2,976,708,000 (2,019,556,000) francs respectively. That Belgium's chemical trade has developed so much more satisfactorily is due firstly to the country's favourable currency position, which has permitted a more liberal foreign trade policy, and also to the large part which chemical fertilisers are playing in Belgian chemical exports. The latter now account for half of Belgium's chemical export trade.

Chemical exports from Germany are still small. During the first three months of the current year the Anglo-U.S. zone of occupation shipped 6,645,000 dollars of chemicals abroad, mainly basic inorganic chemicals and dyestuffs. The pharmaceutical export trade is still very small. The French zone has an efficient chemical industry and will in due course make a growing contribution to Europe's chemical needs, but the Soviet zone production of chemicals seems to go mainly to Eastern and South-eastern Europe, though chemicals from factories in Saxony-Anhalt are being sent to other countries as well under recent trade agreements. Raw material, fuel, electricity and container shortages are retarding the recovery of the West German chemical export industry, and German quarters also complain that dismantlings have affected the peacetime potential of their chemical industry.

Switzerland

Swiss chemical exports rose from 204,021,000 francs in 1938 to 404,464,000 francs in 1946 and 562,616,000 francs in 1947. Swiss chemical imports have risen in proportion and amounted to 225,221,000 francs in 1946 and 289,426,000 francs in 1947. In January-June, 1948, her imports rose to 171,582,000 francs (compared with 144,686,000 francs in the first half of 1947), while Swiss chemical exports declined to 149,652,000 francs (compared with 167,963,000 francs). This decline occurred although Switzerland's exports of dyes and intermediates continued to increase and in the first six months of this year amounted to 25,624,000 (19,185,000) francs. That Switzerland's chemical industry failed to maintain the early post-war pace of export recovery seems to be largely due to the disappointing trade in perfumery and cosmetics and foreign import restrictions which did not leave the pharmaceutical business unaffected.

The Scandinavian states have also suffered from the general foreign trade difficulties. Thus Sweden increased her chemical imports from 275,946,000 kroner in 1946 to 335,272,000 in 1947 and 180,553,000 in the first half of 1948, but her chemical exports (including substantial quantities of matches) rose hardly at all in 1947—93,259,000 kronor against 92,646,000 in 1946—and only slightly in the first half of 1948 when they amounted to 47,457,000 kroner against 44,815,000 in the corresponding period of 1947 (including 13,234,000 and 12,425,000 kroner of matches).

Declining Volume from Denmark

Denmark has imported more chemical fertilisers but smaller quantities of other chemical products, with the result that her chemical imports as a whole at 223,305,000 kroner last year and 109,197,000 kroner in the first six months of 1948 showed only an insignificant increase in value; by volume her imports have been declining. Denmark's chemical exports, on the other hand, confined to a few specialities, rose from 36,915,000 kroner in 1946 to 60,883,000 kroner in 1947 and 34,589,000 kroner in the first half of 1948 (23,178,000 kroner in January-June, 1947).

Norway's chemical exports last year rose from 112,665,000 to 148,562,000 kroner and declined in the first half of 1948 from 82,178,000 to 76,216,000 kroner. Her chemical exports increased last year from 119,279,000 to 133,611,000 kroner, but also declined in the first half of this year—from 74,946,000 to 65,289,000 kroner, mainly because of smaller shipments of fertilisers; these had already declined last year.

The foreign trade of the Scandinavian states as well as of the countries of Western Europe was overshadowed by foreign currency considerations. While chemical imports were admitted to the maximum compatible with the external payments position, chemical exports were not only limited by raw material shortages, production difficulties and other domestic troubles, but also by the inability of other European—and overseas—countries to permit chemical imports.

Reviving British Trade

British chemical exporters fared rather well in comparison with their Continental colleagues in the early post-war period, but last year Britain's chemical exports increased only slightly owing to the loss of output during the fuel crisis, and it was not until this year that British exporters have been able to make up for their disappointing business in early 1947.

Our chemical exports to European desti-

nations have shown a relative improvement, thanks largely to the temporary absence of foreign competitors. If as a result of U.S. financial aid and arrangements for an intensification of trade between OEEC countries intra-European commerce in chemical products expands, Britain's chemical industry will be well able to make a valuable contribution to the supplies needed by other European countries.

Just as before the war the adherence of the Scandinavian states to the sterling bloc had the effect of stimulating British chemical exports to Northern Europe, it should be thought that co-operation under the Marshall Aid programme will result in a similar expansion of trade. Recent statistics show conclusively that lack of foreign currencies has had a marked retarding effect on trade recovery in the chemical field, especially in that sector of it which is considered to be not strictly essential. In the past the most important chemical exporting countries have also been our best markets for chemical products.

There is no reason to assume that the countries of Western and Northern Europe will in future be less willing to buy British chemicals than they were in the past. On the contrary, the changes which have taken place in Europe's chemical industry during the war and post-war period are likely to create greater opportunities on the Continent for British chemical exporters.

Registering Patents in Germany

Filing Office to Open in the U.S. Zone

A FILING office which will receive applications for grants of patents and for the registration of designs and trade marks is to be established to serve the western zones of Germany on October 1. This, the first step towards the establishment of a properly constituted patent office, will be concerned only with receiving and filing applications and will not publish patent material.

Full details of the new organisation are contained in the last issue (September 18) of the *Board of Trade Journal*, which records that the title of the new office is, the Annahmestellen für Patent-, Gebrauchsmuster- und Warenzeichenanmeldungen, and its address is at 102 Rheinstrasse, Darmstadt, U.S. Zone.

For the present the applications filed at Darmstadt will only have effect in the joint British and American zones.

Applications for filing from persons in the United Kingdom may be sent immediately, but all applications which are received by the filing office before its official opening date will bear the date October 1, 1948. To enable persons in the United Kingdom to take advantage of the facility of the new filing office, the Administration of Enemy Property Department announces that the Trading with the Enemy restrictions have been further relaxed and draws attention to the following Statutory Instruments which have been issued :—

Trading with the Enemy (Authorisation) (Germany) (No. 4) Order, 1948 (S.I. 1948, No. 2086). Trading with the Enemy (Transfer of Negotiable Instruments, etc.) (Germany) (No. 3) Order, 1948 (S.I. 1948, No. 2087). Trading with the Enemy (Custodian) (Amendment) (Germany) (No. 4) Order, 1948 (S.I. 1948, No. 2088).

The effect of these Orders is to permit applications for the grant of a patent or the registration of a design or trade mark in Germany and to permit subsequent dealings in respect of any such patent which may be granted, or design or trade mark which may be registered. Moneys accruing as a result of such transactions will not be subject to Board of Trade or Custodian control.

Applications to the filing office should be made preferably through a German patent agent. All arrangements for the services of such agents and for the payment of their fees must conform to the revised Instruction No. 9 of the Joint Export-Import Agency. This provides *inter alia* that contracts or agreements for the services of an agent must be in writing. The conversion rate for services will be 30 U.S. cents to the Deutsche mark. (This is equivalent to 13.43 D.m. to the £ sterling.)

The filing office will charge a fee of 10 D.m. for each application.

Copies of the orders referred to are obtainable from HMSO, Kingsway, London, W.C.2 (2d. each).

Authority was granted several months ago to the principle of enabling persons in Germany to register patents, designs and trade marks in the U.K. Detailed regulations covering this procedure will be published shortly.

Bauxite Output Up.—The production drive of the Berbice Bauxite Co., Ltd., British Guiana, has been so successful that when the m/v. *Samana* sailed in June with a shipment of 3180 tons, production had already exceeded the 1947 figures by 5000 tons, with still six months of this year to go.

BRITISH PLANT AT COPENHAGEN

Other Exhibits of Laboratory and Process Equipment

INFORMATION received this week usefully supplements that published in our last issue relating to the exhibits of chemicals and laboratory plant and equipment at the British Exhibition at Copenhagen, which opened on September 18 and continues until October 3.

W. EDWARDS AND CO. (LONDON), LTD., Kangley Bridge Road, Lower Sydenham, London, S.E.26, is exhibiting examples of the latest types of high vacuum pumps, vacuum measuring instruments and special vacuum plants.

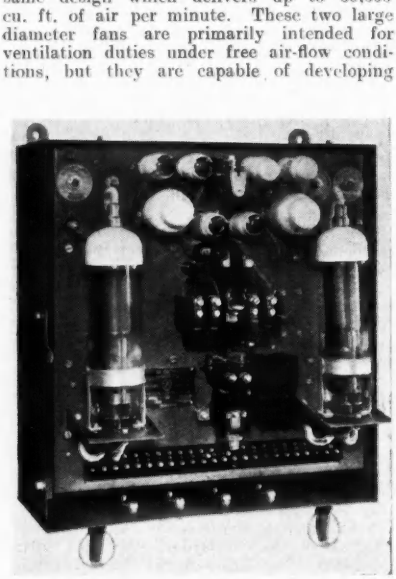
Chemicals

A chemical display in the Forum having an exceptionally wide appeal to industries has been provided by MAY & BAKER, LTD., whose exhibit covers the fields of pharmaceutical chemicals, laboratory, industrial, photographic, aromatic and horticultural chemicals, plastic films and medical and veterinary products. There have been many new developments, represented in the photographic section by Amfix, the ultra-rapid fixer (prints less than two minutes and negatives in 10-20 seconds) and Genechrome, the stabilised colour developer. The most interesting of the new horticultural products, Planofix, inhibits the pre-harvest drop of fruit by control of the abscission layer. In the plastics field the newest development is Ephulon, the plastic tracing medium which lends itself to many different applications.

QUICKFIT AND QUARTZ, LTD., "Triplex" Works, King's Norton, Birmingham 30, is showing a wide range of assemblies of its all-glass laboratory apparatus and of the individual components used. All the usual laboratory apparatus for organic research work is being shown, including assemblies for reaction with stirring and reflux, distillation and fractionation assemblies, water estimation and water distillation assemblies, extraction assemblies and Kjeldahl assemblies. This firm is also showing a range of pipe-line fittings and chemical plant units, including its well known coil-type heat exchangers in capacities up to 25 ft. square cooling surface area. The steam-heated boilers are being shown with fractionating columns, reflux radio heads, and vacuum receiver adapters. A feature of particular interest is the newly designed magnetically operated reflux radio head with swinging funnel. The stand also displays a complete vacuum still erected as for use. This still has a 100-litre vessel with circulatory steam heater, 6-in. diameter helix packed column, 15 sq. ft. surface area condenser, and a vacuum fraction collecting arrangement.

REAVELL AND CO., LTD., Ranelagh Works, Ipswich, is showing, on the stand of its Danish agents, The Scandinavian Steel & Shipping Agency, a two-stage, vertical, single-acting compressor, direct coupled to a vertical, double-acting steam engine by E. Reader & Son. This set has a capacity of 2½ cu. metres of free air per minute compressed to 25 kgs. per sw. c.m. and runs at 525 r.p.m.

On the G.E.C. stand are examples of the fans manufactured by its associate company, Woods of Colchester, Ltd. These include a 60-in. propeller fan, an "Aerofoil" axial flow fan, and a man-cooler fan. The Woods 60-in. propeller fan has an air-foil type of impeller, cast in one piece from aluminium, and gives air deliveries up to 41,000 cu. ft. per minute. There is a 72-in. fan of the same design which delivers up to 60,000 cu. ft. of air per minute. These two large diameter fans are primarily intended for ventilation duties under free air-flow conditions, but they are capable of developing

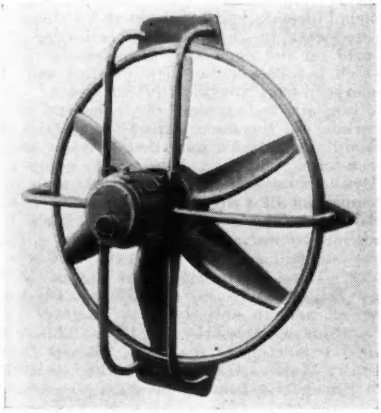


B.T.H. Thyratron motor speed control panel which regulates the speed of electric motors up to 3 h.p. output

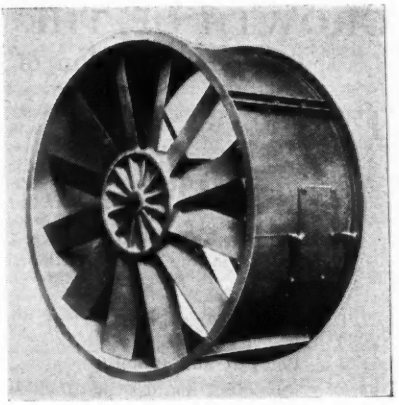
pressures up to half-inch water gauge static pressure. Other sizes of Woods propeller fans have broad-surfaced steel blades designed for smooth and quiet air movement. Six sizes, from 12-in. to 36-in., are fitted with a patent form of resilient suspension which contributes to quiet operation.

The Woods Aerofoil fan exhibited is a 30-in. axial flow fan designed for large air delivery against medium resistances to air flow. These Aerofoil fans are made in nine sizes from 6-in. to 48-in. diameter. They are non-overloading and their efficiency is in the region of 65 per cent. The Woods man-cooler fan provides a powerful, far-reaching air stream for cooling operators in hot areas. A compact Aerofoil fan, carried in a tubular steel cradle, it is lighter in weight than most other fans of this type and can be moved from place to place with little effort. There are two sizes, 15-in. and 19-in. diameter. These fans will give an air velocity of 500 ft. per minute at distances up to 30 ft. from the fan. An air velocity of 250 ft./min. will provide ample cooling in areas exposed to moderate heat, while a velocity of 500 ft./min. gives a good cooling effect to workers exposed to intense radiant heat.

A feature of the Woods fans is that the driving motors are designed specifically for fan duties and manufactured entirely in the Woods factories. They are designed to minimise the possibility of overheating due to overload.



The 60-in. propeller fan
(Photo: Woods of Colchester, Ltd.)



The Aerofoil axial flow fan
(Photo: Woods of Colchester, Ltd.)

THE MAGNETIC CLARIFIER

THE Magnetic Clarifier shown by Philips Electrical, Ltd., at the recent Machine Tool and Engineering Exhibition, Olympia, is reported to have met with a very successful reception.

The clarifier is a variation of the Philips Magnetic Filter. It consists essentially of a small restricted channel into which contaminated coolant is gravity fed, where it flows past a slowly revolving aluminium disc, driven by a small electric motor. Near its periphery this disc carries a series of powerful magnets and as these pass through the fluid they collect the ferrous sludge suspended in it and lift it out of the tank where the magnets are cleaned by wipers which sweep the sludge via a chute into the sludge-containers.

New Asthma Drug

A new substance, Neodrenal, for the treatment of bronchial asthma has been manufactured by Savory and Moore, Ltd. Neodrenal is stated to be more effective than adrenaline in relaxing artificially-induced bronchospasm; there is no rise in blood pressure and unpleasant side effects are slight. The use of this new "oral" form of adrenaline is for symptomatic relief of bronchial asthma; spastic bronchitis; a persistent asthmatic state without typical attacks, and so-called chronic bronchitis of a purely asthmatic nature. Importance in administration is that the drug should be absorbed from the mucosa of the mouth.

GROWTH OF THE PLASTICS INDUSTRY

Rapid Application of New Processes by I.C.I.

THE history of the plastics industry may be said to be reflected by the research in this connection of Imperial Chemical Industries, Ltd. The Plastics Division of I.C.I. was formed in 1936. The company's interest in plastics, however, precedes the birth of the division, but not by much. Fifteen years ago I.C.I. had no manufacture of plastics at all, although chemical research was going on in different parts of the company on certain resins and polymers which are now among the products it sells.

Perspex and Bakelite

If one leaves out natural plastics like shellac, which have been known for centuries, the history of the industry goes back for less than a hundred years, states an article in *The I.C.I. Magazine*, from which the following extracts are taken. The first product, celluloid, a mixture of nitro-cellulose and camphor, was discovered about 1860. Although it is not made by I.C.I., the company has always been interested in celluloid because of the nitro-cellulose it contains, an important product of the Nobel Division of I.C.I. This interest in nitro-cellulose and its use in the early 1930's in laminated safety glass directed attention to a new clear transparent resin called Resin M, based on methyl methacrylate, which had been made in the I.C.I. Dyestuffs Division laboratories. As sometimes happens, the uses thought so promising for a new invention were not realised; instead it became important in other ways. Resin M was a failure for safety glass and the uses expected for it then as a moulding powder were not fulfilled, but it came to make a famous name for itself in peace, as in war, as Perspex.

The second landmark in the history of plastics undoubtedly was the discovery of Bakelite, or phenol-formaldehyde moulding powder, in 1909, but this product did not really become important until after the first world war. I.C.I., between 1930 and 1932, produced at its Dyestuffs Division a product of this type, but it was unsuccessful and was withdrawn. In 1933, however, a fresh start was made when I.C.I. bought a majority shareholding in Croydon Mouldrite, Ltd., which had a small factory at Croydon. This plant had been built in 1924 by Bissik, Fraser & Co. for the manufacture of ebonite dust and the moulding of ebonite battery boxes, and some of the equipment installed then is still in use. The

"Welvic" compound for cable making passing from mixer to rolling mills

name of the company was changed to Mouldrite, Ltd., in 1934, and in 1936, with the acquisition of the rest of the shares by I.C.I., the Plastics Division was born.

While this early work was going on with Perspex and with the manufacture of phenol-formaldehyde products, chemists were working in I.C.I. and all over the world on the chemistry of polymers, from which a succession of new plastics was to emerge during the next fifteen years. At Billingham a group of chemists was working on the manufacture of a series of moulding powders and resins made from urea-formaldehyde. Work was going on elsewhere on these products, and, with the acquisition of Croydon Mouldrite, a small plant for their manufacture had been obtained, known as Kelacoma, Ltd., which was struggling along in Welwyn Garden City. With the modifications suggested by the Billingham team, the UF process was proved and an entirely new factory was therefore built nearby in 1938. This was the introduction of the I.C.I. Plastics Division to Welwyn Garden City, which in 1939-40 became its headquarters.

In the early 1930's, too, work was beginning in the company's Alkali Division on chemical reactions under very high pressure, and from this work came the discovery of another new plastic, polythene. Polythene was first made on a minute scale in

1933, but the difficulties of high-pressure work prevented serious study being made of the product and its process until 1936. From then on progress was fast, and by 1938 the difficulties of the process had been mastered and a continuous pilot plant was working. From this a full-scale plant was developed which came into operation on September 1, 1939, the day on which Hitler invaded Poland. This plant was to make an important contribution to the war.

The outbreak of war, therefore, found I.C.I. as a small but growing manufacturer of phenolic products at Croydon, urea-formaldehyde materials at Welwyn, the methacrylate products Perspex and Diakon on an I.C.I. Plastics Division site at Billingham, and polythene in Cheshire made by the company's Alkali Division. The second world war had a great effect on the division. It saw a huge growth in the demand for the thermoplastic materials Perspex and polythene, and in an entirely new group of plastics based on another polymer known as polyvinyl chloride. Perspex sheet was required in large quantities for aircraft because of its lightness, strength, resistance to weathering, ease of shaping, and clarity. Without it the RAF would have been at a serious disadvantage, for a similar material known as Plexiglas was being used by the Germans. Output was increased at Billingham, and a new factory at Darwen in Lancashire was chosen for manufacture in 1940, followed by a third factory at Rawtenstall in 1941. So great was the expansion of the Perspex demand that I.C.I. had by the end of the war a plant capacity of 6000 tons per annum, with which it can compare a production in 1938 of 155 tons and in 1936, 25 tons.

High Frequency Insulation

Polythene, too, became required in great quantities. When war broke out the product was regarded as a promising insulation for submarine cables, but the wartime development of radar created the need for an insulation capable of standing very high frequencies, and polythene filled the bill. As a result, the first plant at Wallerscote was increased to six times its original size, and a large new plant was built at Winnington, where production began at the end of 1941.

The next big wartime development was that of PVC products, which the I.C.I. Plastics Division had been studying before the war. Early in the war plasticised compounds were made from imported American PVC, but the first I.C.I. production of polymer began in 1940 in its General Chemicals Division factory at Runcorn. With the entry of Japan into the war and the disappearance of rubber, the importance of PVC for general cable insulation was greatly increased. A large plant was erected by I.C.I. for the Government at the war chemicals site at Hillhouse, near Fleetword in Lancashire. This plant started production in 1944. The Hillhouse plant was acquired by I.C.I. in 1946, when it decided to remain there permanently and develop the site fully.

Among the many plastics developments in the United States has been the important invention of the nylon group of polymers. The I.C.I. Plastics Division was given the job of making nylon into monofilament for brushes, surgical sutures and fishing lines, and early in 1941 a plant was started at Welwyn using nylon polymer manufactured by the I.C.I. Dyestuffs Division. The manufacture of monofil, most of which went for tooth-brushes, was regarded as of high priority throughout the war.

Increasing Production

The end of the war brought many problems to the company's Plastics Division. The older thermosetting materials, the phenolic and UF groups, had found their industrial levels before the war, and the post-war demand for them was therefore the more easily estimated. With the new materials, however, after a sharp drop in demand when war contracts were cancelled, a survey of markets at home and abroad showed the company that, far from decreasing its output, the Plastics Division should erect new plants and increase production as soon as possible.

Polythene has become a much wanted post-war material. Submarine cables have developed, as was expected before the war, although the first polythene submarine cable was laid from England to France for army communications only just after D-day. Last year the first post-war submarine telephone cable, from England to Holland, was laid which was insulated with it. Non-electrical uses have also developed in moulding powders and decorative sheet materials, and water-resistant thin films are nearly ready for offering to the market. The PVC group of products is also much in demand to-day, outside its wartime cable uses.

To-day finds the I.C.I. the largest manufacturer of plastics materials in the British Empire and among the half-dozen largest producers in the world.

For the future the I.C.I. Plastics Division has important tasks. The first is to consolidate and develop the present range of products in its new and extended factories for sale both here and in its expanding markets abroad. The second task is to develop new products for the future.

HEALTH SAFEGUARDS IN INDUSTRY

Doctors and Technicians Compare their Observations

SPEAKING, on September 17, at the closing session of the ninth International Congress on Industrial Medicine, which was opened on September 13, the Rt. Hon. Lord Webb-Johnson, K.C.V.O., C.B.E., D.S.O., T.D. (president of the Royal College of Surgeons), who presided, congratulated all concerned on the success of the congress. He said that, as a child, he had known only too well the perils of working in one industry in particular—pottery manufacture. He saw so many workers there suffering from lead poisoning, and very little was then being done about it. That was a long time ago. Later, as a student in Manchester, he had seen brought into the hospital from the mills women who had been scalped, and he had noted the cavalier way in which those, as well as the minor injuries, were treated by the medical staffs. He was pleased to say that nowadays much was done at the factory source in the way of accident prevention and improved health conditions.

Work of Pioneers

Lord Webb-Johnson referred in glowing terms to the good work done in recent times in regard to colliery diseases and accidents, such as spine injuries.

The picture which Dickens painted of conditions in industrial plants had to a large extent been changed. Those bad old circumstances had gone, very largely because of the work of the pioneers.

When the medical profession, the nursing profession, and the architect had all done their best to improve the lot of workers in industry—as they had done—it remained for the employers, and then the employees, to do their best and to co-operate for the common good. But there must not be too much dependence on science and planning by the State. There was the danger of a man being so highly directed as not to be doing the work he wanted or was most suited for. In spite of all the planning, success depended largely upon the human spirit.

There was much to be said for the value of prevention, as contrasted with the granting of convalescent leave. They (the doctors) must, for example, use their best endeavours to find a way of preventing such things as tumours of the bladder associated with work in the manufacture of certain chemicals, and the complaints arising from working in close proximity to radioactive substances. Above all, they wanted leadership in these matters, and they had the most wonderful material in the world on which to draw.

Sir Ewart Smith, M.A., M.I.Mech.E. (member of the Advisory Council on Scientific Policy), spoke on "The Contribution of Engineering to Industrial Health." He said engineering in relation to industry was particularly important because on it depended essentially the conception of the lay-out of industrial plants. It catered largely for the needs of the human beings who had to operate the machinery and plant in the factories, and therefore had an important bearing on the health and happiness of those workers.

He made a plea for the designers of machinery not to be forgotten when they were thinking about industrial health and the prevention of accidents in factories. The designer should be brought in at the earliest stage. It would be seen, then, that the engineer had to play a very important part in psychological as well as physical health in industry.

As regards plant lay-out, said Sir Ewart Smith, they had to design so that there was a proper flow of materials to ensure efficient and economical working, with sufficient spacing of the machinery and workpeople, so that the latter had adequate and suitable light and air space. The engineer should co-operate with the architect, and should not regard the latter merely as the one who put on the frills at the later stages. Then the engineer was concerned with the lessening of human effort, with effecting the change from manual to automatic effort.

Conserving Human Energy

Also coming within the scope of the engineer, went on Sir Ewart Smith, heating and ventilation were of growing importance in regard to the conserving of the energy of the worker as well as from the actual health point of view. And they must not lose sight of the importance of avoiding dust and noxious gases and fumes in industry. Science, if properly applied, could nowadays find the answer to all these things. Noise and vibration also came within the purview of the engineer. Here, again, science had provided ways and means of removing such objectionable conditions.

The engineer is vitally concerned with matters of safety in industry, went on Sir Ewart Smith, and the use of codified knowledge was of great importance in this. But merely to give canteens and other amenities to the workers did not achieve this. One had to get behind the picture and to find what the workers were thinking. He, per-

sonally, believed that the psychological side was much more important than the material aspect, and he felt that these things depended largely on leadership and management.

Incentives played an important part. He believed that they should try to work out some incentive on the team basis, and he thought they should provide interests for the workpeople in their leisure hours. Improving conditions in industry was a joint business. In that way, each man was more likely to take a pride in his job, and they would then get that leadership which this country needs and deserves.

The following are synopses of some of the papers of chemical interest which were read during the congress, the full texts of which will be published later by the Medical Research Council :—

Dr. Hubert Wyers (Great Britain) :

" Some Recent Observations on Hazards in the Chemical Industry."

Atebrin. One of the newer anti-malarials. Workers exposed to the dust complained of seeing blue haloes around lights. The cause was a diffraction effect consequent on the deposition of intracellular granules of an insoluble derivative of atebrin in the corneal epithelium.

Sulphur. Female workers exposed to the dust of sublimed sulphur developed a disfiguring folliculitis of the face without any signs of contact dermatitis.

Vanadium. The pentoxide may produce systemic effects (pallor, dyspnoea, palpitation, tremor), local effects on the tongue (greenish-black discoloration) and reticular shadows on the chest skiagram. Four laboratory workers engaged on fusing vanadium oxides all developed pneumonia.

Silver. Argyria, once common as a side-effect of chemotherapy, is now rare. It occurred in a chemical process worker fingers were repeatedly contaminated by a solution of silver nitrate as he poured it from one test tube to another.

Metol. This substance is generally associated with " photographers' itch." When it is inhaled in large quantities it causes systemic poisoning. The molecule contains phenyl and amino groups and their characteristic symptoms of black urine (carboluria) and cyanosis (methaemoglobinaemia) may be found present together. The interpalpebral fissure may be stained a yellowish brown.

Dr. P. Pachner (Czechoslovakia) :—

" Lead Poisoning at Blast Furnaces."

Lead poisoning of moulders working at blast furnaces is not unknown but is very seldom described, so insufficient attention is paid to it. Working at blast furnaces is now, in the time of good hygienic provisions in most industrial sectors, one of the rare, but nevertheless serious risks of injury due to lead.

The author gives an account of some typical cases of chronic lead poisoning of moulders at the blast furnaces, accompanied with typical clinical symptoms and laboratory findings, arising from the use of iron ores with high content of lead. The rule of removing lead accumulated in the blast furnaces has not been observed.

The result of removing the technical faults and regularly discharging the lead from the bottom of the furnace has been that not a single case of lead poisoning has been seen despite the fact that the raw materials have remained unchanged.

Averting Radioactivity Risks

Dr. Hermann Lisco (U.S.A.) :—

" The Potential Hazards and Pathological Aspects of Radioactive Isotopes."

Recent advances in nuclear physics have already commenced to have a considerable impact on biological and medical research by providing new tools for investigation. More and more use will be made in the future of radiant energy in private research laboratories, Government agencies and in industry in the peace-time developments of atomic energy. This poses new and often perplexing problems to the public health officer and to the physicians engaged in the practice of preventive medicine.

The literature is replete with human case records and with experimental data, which demonstrate the harmful effects of ionising radiations if no proper precautions are taken in the course of such work.

In this paper is discussed recent experimental work in which the acute, subacute and chronic pathological effects of radioactive isotopes have been studied. These studies have been primarily concerned with radioactive materials released in the fissions of uranium and plutonium. Preliminary results with p^{32} are also discussed.

Dr. A. E. Nyström (Sweden) :—

" Health Hazards in the Chloroprene rubber Industry."

The production of synthetic rubber in Sweden is carried on mainly by chloroprene synthesis. During the period 1944-48 the state of health of the workers in this industry has been followed. Symptoms manifested themselves almost solely among those exposed to chloroprene. About 80 per cent of them were affected with intense pain in the chest after even mild physical exertion. Others complained of palpitation, dyspnoea and giddiness. As many as 90 per cent of the workmen employed in the polymerisa-

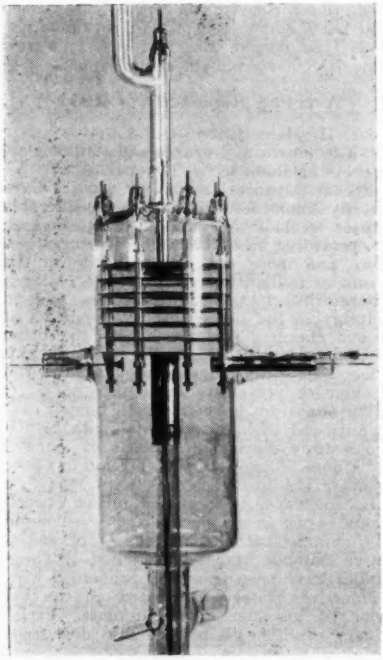
(*Continued on page 422*)

A NEW MASS SPECTROMETER

Aid to Study of Negative Atomic Ions

(From Our New York Correspondent)

DR. WILLARD H. BENNETT, of the U.S. National Bureau of Standards, investigating conditions for the formation of negative atomic ions of the heavier metallic element, has succeeded in developing a vacuum tube specially designed to provide a greatly simplified and flexible radio-frequency mass spectrometer for detecting, separating, identifying, and measuring such ions.



One of the new tubes for the study of negative atomic ions

Since negative atomic ions, consisting of atoms with extra electrons, have very low energies of formation, their study hitherto has been very difficult, because of the rapid dissociation of the ions in very short distances of travel; *i.e.*, before they can reach a measuring electrode. The new spectrometer not only opens up a new means of exploring the little-known fundamentals of negative atomic ions, but its special characteristics make it widely applicable for other uses, including the mass spectrometry of positive ions.

Experiments begun at the National Bureau of Standards by Dr. Bennett in 1946 indicated that negative atomic ions might well exist in the many familiar forms of electrical discharge in vacuum tubes, but that they would not be detected if the distance through the tube between the discharge and the electrode was large. It was necessary to devise an experimental method, incorporated in the new spectrometer, for separating and identifying such ions within distances of only a few centimeters.

Study of Positive Ions

In its more advanced form, this two-stage spectrometer may be used for positive ions as well as negative ions. The equipment consists of a multigrid tube in which an adjustable radio-frequency is applied to two grids, while all other electrodes are held at the proper direct-current potentials, and the ion current is measured at the plate. The more exacting requirements of negative-ion separation require the use of a small magnetic field produced with coils, but if positive ions are being separated, no magnetic field is needed.

One of the principal limitations upon the resolution possible with the ordinary mass spectrometers using magnetic deflection of beams has been the spread in energies of the ions at the ion source. The percentage spread occasioned by this factor can be reduced by increasing the voltage applied to the ions before they are magnetically resolved. The extent to which this can be done is limited however by the magnetic field that can be obtained in a space sufficient to contain the tube.

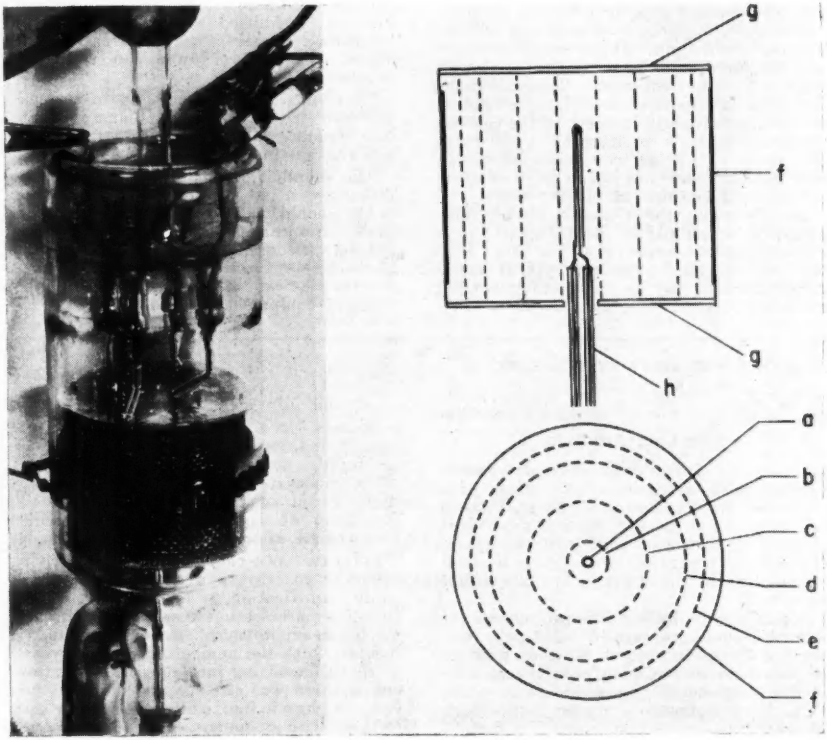
In the radio-frequency mass spectrometer, the bureau states, this difficulty is eliminated and the voltage of the ions can easily be raised to any value for which insulation can be provided. The frequencies required are then increased by an amount equal to the square root of the factor by which the voltage is increased. Raising the voltage from 100 to 10,000 volts, for example, increases the frequencies ten-fold, and reduces the percentage spread of mass line,

due to velocity spread in the ion sources, by a factor of 1/1000.

The first successful radio-frequency mass spectrometer, a single-stage six-electrode tube, consists of a cathode about which are arranged four co-axial cylindrical grids and an ion-collecting plate. Helmholtz coils surrounding the tube provide a 100-gauss magnetic field in a direction parallel with the axis of the tube. Such a field is required in negative-ion work to confine the electrons to the space inside the first grid and to avoid the formation of positive ions in parts of the tube where neutralisation of the negative ions may occur before they reach the detecting electrode.

In the operation of the single-stage negative-ion spectrometer tube, ions arising at the cathode are accelerated through the first grid at a velocity corresponding to the DC potential of that grid (say 15 volts). They are further accelerated by the field due to the potential on the second grid which is an alternating radio-frequency (say 5 volts) plus a DC potential (reduced to 10 volts). The third grid is held at a DC potential (reduced to 5 volts).

Those ions which pass the first grid at the proper phase of the RF field, and which have such mass and related velocity to pass through the second grid while the RF potential changes phase, receive an additional acceleration due to the RF field while travelling to the third grid. It was found



Two presentations of the single-stage, six-electrode mass spectrometer, of which the diagram on the right shows the assembly of the cathode (a), the four co-axial cylinder grids (b, c, d, e) and the ion-collecting plate (f). Mica discs (g, g) close the electrodes, excepting the orifice where the glass-insulated cathode lead (h) extends. By surrounding the tube with Helmholtz coils a magnetic field is formed for negative ion study

experimentally, verifying theoretical calculation, that ions passing the first grid at 45° 27.5′ of phase angle of the alternating current on the second grid, and having just the right mass (and corresponding velocity) to pass the second grid at 180° of phase angle of the current on that grid, will pass each of the first three grids with the same velocity (corresponding to 15 volts), although the DC potentials on those grids are successively reduced. This is caused by the ion picking up energy from the field of the alternating current on the second grid since the change in phase occurs as the ion passes through this grid.

A blocking potential difference, nearly equal to the maximum energy which an ion with the proper mass (corresponding to the frequency) could pick up from the alternating current, is applied between the cathode and the fourth grid. The blocking potential may be, for example, 9.6 volts negative with respect to the cathode. The collecting electrode, or ion-collection plate, is held at 40 volts positive with respect to the cathode to insure that no positive ions will reach the anode. An electrometer tube circuit and galvanometer are used for measuring the selected ion currents to the anode.

By observing the negative atomic ions produced at an oxide-coated cathode in a water-vapour atmosphere at less than 10^{-6} mm. of mercury pressure, typical mass-resolution data may be obtained for plotting resolution curves. The data is taken while holding all potentials constant and varying only the applied radio frequency. For example, an AC potential of 5 volts may be used while DC potentials of less than 100 volts are applied to the other electrodes. The required frequency range extends from 3300 kc. for a mass value of ¼, to 104 kc. for mass value 250. This range of readily producible radio frequencies more than covers the full mass range of all elements.

By extending the method to two stages in a nine-electrode tube, either with cylindrical or parallel-plane electrodes, and applying the radio frequency to two of the grids, a higher order of mass resolution is obtained. Such a large number of grids would not be practical in a tube if the usual woven-wire screens were used. There is available now, however, a knitted wire fabric which has more than 95 per cent open area and with which this kind of tube can readily be constructed.

This apparatus may be used in the mass spectrometry of positive ions and in ionisation studies, as well as in the present negative-ion investigations.

The simplicity and low cost of the radio-frequency mass spectrometer, the bureau holds, should make it attractive not only in those applications in which its special characteristics make it superior to other kinds of mass spectrometer, but also in those laboratories where the expense of other types of equipment is prohibitive.

HEALTH SAFEGUARDS IN INDUSTRY

(*Continued from page 419*)

tion department were affected with alopecia.

Effect on Animals

Experimental tests with chloroprene made on animals showed a high toxic effect, with functional disturbances in the liver, kidneys and organs of circulation, as well as changes in the coagulation conditions of the blood. The generally negative findings on medical examination of the workers are, therefore, remarkable.

According as hygienic improvements of various kinds were carried out in the factories and the attention of the workers awakened to the existing risks, practically all the symptoms disappeared.

Dr. Poul Bonnevie and Dr. Aage Grut (Denmark) :—

"The Hazards of Acute and Chronic Carbon Monoxide Poisoning in Industry."

In the blood of workers in foundries the carbon monoxide haemoglobin percentage proved to be 7-20 after a working day, 90 per cent of them showing acute symptoms on the moulding day, while only slight symptoms of chronic carbon monoxide intoxication occurred, the exposure being too short and infrequent.

In gasworks a few acute and chronic cases were found, exposure occurring only in old-fashioned, defective working procedures. After moderate exposure to gas—8 hours daily—8 out of 15 female workers showed symptoms of chronic intoxication which disappeared after improving ventilation.

Forty-two per cent of chauffeurs driving producer gas cars had shown symptoms of acute intoxication. The occurrence of chronic intoxication was not greater among heavy tobacco smokers, nor did it increase with the number of working years. With an increasing rate of acute CO intoxication there was an increase in the occurrence of chronic intoxication, but 32 per cent of those with symptoms of the chronic form never had any symptoms of acute intoxication.

The conclusion must be that chronic carbon monoxide intoxication develops only where the exposure is of such frequency and to such concentration that acute intoxicaion is not set up.

NEW SOURCE OF INDUSTRIAL ALCOHOL

Shell Refinery's Addition to U.S. Supplies

A LARGE addition to American supplies of ethyl alcohol from petroleum refinery processes instead of the commoner fermentation method was due to start this month at the Shell Chemical Corporation's new plant at Houston, Texas. Of this $12 million plant *Chemical and Engineering News* reports that its planned output will be about 18 million gall. annually, the equivalent of some 6 per cent of total production of ethyl alcohol. The development by Shell of a satisfactory method of deriving this product from petroleum products is expected to have a profound effect in future years on the entire alcohol industry.

The basic raw material for the Shell process, says *Chemical and Engineering News*, is ethylene, which is obtained with other olefins in the stream of gases from the great catalytic oil cracking plant at the adjoining refinery of the Shell Oil Co. After careful separation and purification the ethylene is converted by direct hydration into ethyl alcohol.

Varied Products

The new plant was started in early 1947, with other important units in Shell Chemical's multimillion dollar expansion in Houston. Most of these units have now been completed and the Deer Park plant is producing such items as methyl ethyl and methyl isobutyl ketones, *sec*-butyl alcohol, allyl alcohol, and various chlorohydrins and derivatives. An additional important unit, that for the manufacture of synthetic glycerol, is expected to go on stream in the near future.

The new alcohol unit will be operated under strict governmental supervision. Although none of the product will be used in the manufacture of alcoholic liquors, some idea of the plant's size may be gained from the fact that it is estimated that to produce a similar quantity of alcohol by fermentaion processes would require 45 million bushels of grain.

Many Uses

Under the trade-name Neosol, Shell will offer the ethyl alcohol as a proprietary solvent. It will also be available in government-approved standard specially de-natured grades. Among its very wide industrial applications are those of formulation of lacquers and varnishes, manufacture of anti-freeze, processing of foods and vitamins, extraction of drugs, dyestuff synthesis, and plastics, rayon and cosmetics manufacture.

Utilising the same basic raw material, ethylene, but aimed in an entirely different direction, is a second plant unit announced for Deer Park, also to begin commercial-scale production in September. This unit will manufacture ethyl chloride, at present used as a chemical intermediate in the manufacture of plastics.

This development at Houston, writes our New York correspondent, represents the fruition of a policy long pursued by the Shell interests to found a new industry based on allyl compounds derived from petroleum hydrocarbons. The units at Houston will yield allyl chloride, allyl alcohol, glycerol epichlorohydrin, glycerol dichlorohydrin, diallyl phthalate, diallyl ether, acrolein, ethyl, isopropyl, and secondary butyl alcohols, acetone, methyl ethyl ketone, and ethyl, propyl and propylene chlorides. The whole project, involving an investment of upwards of $45 million has been based on processes originating from Shell Development's research.

Another Phthalic Alkyd Resin

A NEW phthalic alkyd resin, known as Aroplaz 1248-M, which does not haze in the presence of zinc oxide and permits mirror-like finishes and retains its gloss, was introduced last week by U.S. Industrial Chemical, Inc., New York City. A pure, long-oil, oxidising alkyd, supplied as 70 per cent solids in mineral spirits, the product is applicable for formulation of architectural paints and enamels, especially for use in mill whites for textile mills, and for all maintenance finishes. The company claims that, up to the present, alkyds have tended to develop a surface haze giving the appearance of a thin film of chalk, which was particularly pronounced when zinc oxide was used in pigmentation. As zinc oxide is essential to prevent yellowing of white enamels, hazing has been a serious drawback to the use of alkyds in such enamels.

Specifications to which Aroplaz 1248-M conforms are as follows: non-volatile, 69-71 per cent; solvent, mineral spirits; viscosity, Z-Z2 (22.7-36.2 poises); acid number of non-volatile, 8-12; colour (Gardner Standards, 1933), 7-9; weight per gallon at 25° C. (solution), 8.05-8.15 lb.

American Chemical Notebook

From Our New York Correspondent

OFFICIAL inventories, listing and describing the general-purpose equipment for peace-time production of 100 war and industrial plants declared available for reparations from Germany, have been received by the Office of International Trade, U.S. Department of Commerce. While these plants have been declared available for reparations, they have not as yet been allocated by the Allied Control Authority. The inventories indicate that the plants are suitable for the production of a wide variety of merchandise including metallurgical products, activated carbon, acetone from acetic acid, plastics and chemicals, pumps and compressors, and equipment for the production of liquid oxygen and bottled industrial oxygen.

* * *

The Du Pont Company announces that it has submitted 4260 patents, about two-thirds of the patents the company owns, to the U.S. Patent Office for listing in the Patent Register as available for licensing. The first official list of Du Pont patents is expected to appear in an early issue of the Patent Office Gazette. The company states that study of its patents will be continued to determine what additional listings may be made from time to time, and patents not included in the present registration are not necessarily withheld from consideration for licensing. The present list was compiled only from patents granted since January 1, 1933, as those with only a short remaining life were not considered. The life of a patent is 17 years.

* * *

First steps towards increasing the U.S. titanium supply have been taken by the Kennecott Copper Company and the New Jersey Zinc Company which are to construct a $20,000-$25,000 titanium smelter at Sorel, Quebec. Initial contracts have been made for power with the Shawinigan Water and Power Co. Construction of the plant is to start almost at once and ultimately the plant will ship up to $10 million worth of titanium slag annually to the United States. The research department of the water and power company played an important rôle in the development of a process by which the titanium slag will be economically separated from the iron ore. Prior to the war, high quality titanium-bearing ores were readily available from the State of Travancore in India, but regulations recently imposed on exports have made it necessary for users of titanium to look for other sources of supply. The titanium content of the Quebec ore was intimately mixed with iron ore, and until the new process was developed separation of the two to produce a titanium slag of sufficiently high quality for the manufacture of titanium dioxide was an extremely difficult task.

* * *

The manufacture of Lactoprene EV, the modified polyacrylic ester experimental product developed by the Eastern Research Laboratories of the U.S. Department of Agriculture, has now been developed on pilot plant scale by the B. F. Goodrich Chemical Company, Cleveland, Ohio. To be redesignated as Polyacrylic Ester EV, it will complement other nitrile and polyacrylic ester type rubbers now being manufactured by the Goodrich Company.

* * *

The New York Office of (Supreme Command Allied Powers) Foreign Trade, has announced that more than 300,000 metric tons of unassorted, semi-finished and finished alloy steel and alloy scrap, of which about half is owned by agencies of the Japanese Government and the remainder in the hands of private owners, will soon be made available in Japan for export sale. Scrap owned by Japanese Government agencies will be sold by the Japanese Board of Trade on a sealed-bid basis, and stocks will be disposed of through private buyer-seller negotiations under procedures applicable to established floor prices. These contracts, to be approved by the Board of Trade and validated by SCAP, became effective last week.

* * *

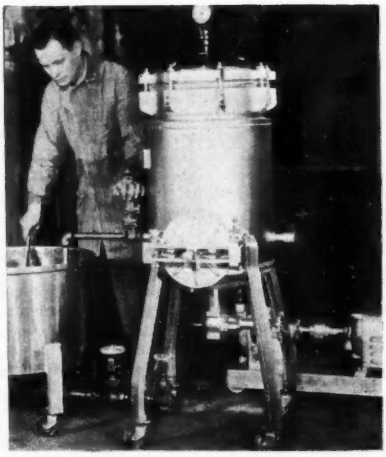
The American Iron and Steel Institute has now announced that deliveries of all finished steel products in the first seven months of 1948 were more than 1.3 million tons greater than in the corresponding period last year. The institute said that shipments of cold-rolled sheets set a monthly record of 583,417 tons in July, raising this product's total for the first seven months of the year to 3,868,500 tons, or 23 per cent more than the shipments in the same period of 1947, when a peacetime record was established. Total shipments of steel products in July amounted to 5,229,880 tons or 5.1 per cent more than the figure for July, 1947.

Technical News and Services

THE 80th edition of the "Chemical Manufacturers' Directory," newly issued, helps to supply a need to which the frequency of requests received by THE CHEMICAL AGE for information relating to supplies of various chemicals bears witness. The editor of this reference book makes no claim to have embraced the whole increasing multiplicity of chemical products, but the data he presents in the 199 pages of editorial and advertising text should answer many of the problems with which all users are confronted from time to time. The information comprises principally a list of chemicals alphabetically arranged, with appropriate cross-references (52 pp.) and similar arrangements of names, products and postal, rail and telegraphic information about chemical manufacturers in England and Wales (102 pp.), in Scotland (13 pp.) and in Eire and Northern Ireland (2 pp.). Two pages are devoted to chemical brokers and agents in London. (Price 6s., post paid, from 21 City Road, London, E.C.1.)

* * *

To fill the increasing demand for carrying out filtration tests on a pilot scale under plant conditions, prior to actual plant scale purchase, one New York engineering firm—the Niagara Filter Corporation, has inaugurated a new service which facilitates pilot plant operations through rental of pilot plant filter equipment. Constructed as exact small-scale models of the firm's production size vertical pressure-leaf filters, which may have up to 500 sq. ft. of filter area, the pilot filters themselves have up to 12 sq. ft. of area and are constructed entirely of type 316 stainless steel. The small-scale appliances are available with or without steam jackets and cake removal door.



The pilot-scale pressure leaf filter

* * *

The 1948-49 edition of "The Fire Protection and Accident Prevention Year Book" (Benn Brothers, Ltd., at 10s. 6d. post paid) is now ready. The edition is limited by paper rationing, and early application for copies is advisable. The book contains a complete directory of makers and suppliers of fire protection and factory safety equipment, in addition to particulars of the new County and County Borough Fire Brigades, their principal officers and their equipment. In addition, it embodies a wealth of technical matter of value to the industrialist in preventing fire or solving works fire and accident problems.

* * *

The production of thermostatic bimetal is described in one of three reports on bimetal manufacture published by the Office of Technical Services, Department of Commerce, Washington. Two other reports discuss the production of bimetallic strip and bimetal tubing. They give information on German methods and equipment used for bonding, rolling, annealing and pickling. Specifications of component metals used and of bimetals produced are included. The reports describe all operations and contain several appendices which present coefficients of expansion and other properties of the standard German bimetals.

* * *

A wide range of split type bushes for automatics have now become available from Protolite, Ltd., and are recommended in cases where steel bushes frequently have to be replaced on account of wear. All Prolite bushes are fitted with the company's cemented tungsten carbide which has high wear-resisting properties.

Home News Items

Limited Mails to Palestine.—Air and surface mail services from this country to Palestine have been extended to certain places in Arab-controlled areas of which the following are the more important: Beersheba, Bethlehem, El Faluja, Gaza, Jenin, Nablus, Ramallah and Tulkarm.

Carbon Black.—Notice has been given of a change in the name of The Palatine Development Co., Ltd., to Philblack, Ltd. The company has obtained from The Phillips Petroleum Co., of Oklahoma, U.S.A., the rights to manufacture two types of carbon black in this country. (THE CHEMICAL AGE, August 21.)

Self-Cleaning Paint.—Technicians at the British Railway paint laboratory at Derby, have invented a new self-cleaning white paint for use on equipment required to be seen clearly. The process known as "controlled chalking" consists of the slaking off of the old coat of paint leaving a new one below. Similar paint in other colours can be produced, but the actual colours and intervals at which the layers slake off are secret.

Overall Wage Increases.—In the House of Commons last week Mr. Isaacs, Minister of Labour, informed Mr. Boyd-Carpenter that increases in rates of wages reported to his department as taking effect between the beginning of February and the end of August, 1948, affected nearly 4.5 million workpeople and resulted in an aggregate increase of £1 million a week. He was unable to say how many increases had taken place.

Overseas Gifts.—While the exact figures of incoming gift parcels are not available, a statement from the Post Office says it is estimated that during last year upwards of 14 million parcels were received in the civil mails from abroad, and about 85 per cent of these were gift food parcels. The principal donors were the U.S.A. (over 3¾ million) and Australia (over 3¼ million parcels). This is exclusive of schemes under which food is sent to this country in bulk shipments.

Education in Fuel Technology.—A two-year post-graduate course in chemical engineering leading to the degree of Master of Science in Chemical Engineering at Durham University is being offered from next month at King's College, Newcastle-upon-Tyne. The course will be available to graduates in Mechanical Engineering or those possessing some equivalent degree or qualification. Opportunity has been taken of linking chemical engineering with the teaching of fuel technology.

New Cellulose Paint Plant.—Construction of a new factory for the manufacture of cellulose paints at Seaward Street, Glasgow, has been approved by Glasgow Corporation Sub-Committee. The sponsors are A. H. Robinson & Sons, paint factors, of Golspie Street, Govan, Glasgow.

Dyeworks Strike.—Some 300 men and women went on strike at a Bradford dyeworks on September 15, following a dispute with their employers, Edward Ripley and Son, Ltd., over the engagement of one man. A representative of the firm described the strike as "unofficial" and "a domestic matter."

Coal Output Below Target.—Last week's coal output was up by some 26,000 tons on the previous week, mainly on account of an improvement in deep-mined coal, although about 17,000 more tons were lost through recognised holidays. The total of 4,053,000 tons is still considerably below the weekly figure needed to reach the year's target.

Disposal of Chemical Ammunition.—The last load of chemical warfare ammunition to be disposed of under arrangements made by the Ministry of Transport, was carried by the *Miervaldis* when she sailed from Barry to be scuttled in the Bay of Biscay. She was the seventeenth ship used for this purpose, and her load of 1880 tons brought the total disposed of in this manner to nearly 100,000 tons.

I.C.I. Works Closing.—Notices were posted last week at the Holme works of the I.C.I., Ltd., plastics division at Rawtenstall informing the 200 employees that the works will close on November 14. Offers have been made to the employees, 37 of whom are staff workers, of alternative work with the firm at its other works in Lancashire. The directors state that the decision to close the Rawtenstall works has been made to ensure "increased efficiency" in production.

Czechs to Aid Export Drive.—Specialised technology related to the manufacture of translucent hard-glaze china will be employed in this country by two former Czech industrialists (now naturalised British subjects), Mr. J. C. Bryan and Mr. J. Ehrlich. They will be joint managing directors of a new factory at Hebburn-on-Tyne which is being built by the Board of Trade with Treasury assistance. The factory will employ 345 at first, but that figure is expected to be doubled within five years. Production should begin in May next year.

PERSONAL

LT.-GEN. SIR W. G. LINDSELL, G.B.E., K.C.B., D.S.O., M.C., who has been a director of Petrochemicals, Ltd., for the past two years, has been elected chairman of the board in place of Mr. H. Stuart Ebben. Mr. Ebben has been chairman of Manchester Oil Refinery, Ltd., since its inception in 1938 and retains his seat on the board of Petrochemicals, Ltd. General Lindsell, who is 64,

Lt.-Gen. Sir W. G. Lindsell

after his retirement from the Army in 1945 was appointed chairman of the Disposals Board, being responsible for organising the disposal of £10,000,000 worth of Government surplus stores for the Board of Trade. He joined the boards of Manchester Oil Refinery, Ltd., Petrocarbon, Ltd., and Petrochemicals, Ltd., in 1946.

MR. THOMAS F. LAURIE, who was entrusted with the formation of the Irish-American Oil Co., in 1922, will be taking up a new position as chairman of the company at the end of the year. This will prove a popular appointment in Dublin where he has held many public offices, including the presidency of the Dublin Chamber of Commerce. He was appointed a general sales manager of the Anglo-American Oil Company in London in 1938, and later moved on to the International Association (Petroleum Industry), Ltd. On the outbreak of war he was seconded to the Petroleum Board, where he served as general sales manager. He is a Fellow of the Institute of Petroleum and a member of the council.

PROF. DOUGLAS MCCANDLISH, head of the Leather Industries department, Leeds University, was elected the first honorary life member of the Society of Leather Trades' Chemists at their annual meeting, in recognition of his services in the advancement of leather science. In 1919 he was appointed to his present position in the university at which he had graduated with honours. The professor has also held industrial posts in Leeds and was chief chemist to A. F. Gallum and Sons, of Milwaukee, one of the largest tanning firms in the U.S.A. He was appointed president in 1925 of the Society of Leather Trades' Chemists and occupied the office for two years.

SIR FRANCIS EVANS, British Consul General for New York City, has decorated DR. O. S. DUFFENDACK, of White Plains, New York, with the ribbon of the King's Medal for Service in the Cause of Freedom for valuable services rendered to the Allied war effort in various fields of scientific research and development. The insignia itself is to be presented at a later date. Dr. Duffendack was, until 1944, Professor of Physics at the University of Michigan, where he directed research activities for 16 years. He is now president, vice-chairman of the board and director of research for Philips Laboratories, Inc., at Irvington-on-Hudson, New York, and a director of North American Philips Company, Inc., of New York.

MR. MEREDITH GWYNNE EVANS, D.Sc. (Manchester), F.R.S., at present professor of inorganic and physical chemistry in the University of Leeds, has been appointed to the Chair of Physical Chemistry at Manchester University in succession to Professor Michael Polanyi. Professor Evans, who will take up his duties in Manchester in January, 1949, has published a large number of papers on kinetics and the mechanism of chemical reactions, and has built up a large and active research school in Leeds.

MR. W. T. COOPER has been appointed assistant secretary (editorial) of the Institute of Fuel. He was at one time physics master at Tettenhall College, Staffordshire, and later on joined the staff of the Institution of Electrical Engineers, of whose journal he became assistant editor. For the past five years. Mr. Cooper has been scientific editor and head of the publications department for the British Coal Utilisation Research Association at Leatherhead.

(Continued overleaf)

Radioactivity and Engineering Discussions

Changing Conditions of Inorganic Chemistry

PROFESSOR H. J. EMELEUS will discuss "The Impact of Radioactivity on Inorganic Chemistry" in his three lectures at the Royal Institution (the eighth post-graduate series organised by the London section of the Oil & Colour Chemists' Association) at 6.30 p.m. on Thursdays, September 30, October 7 and 14. The chemistry of radioactive substances will be discussed in the first lecture, including those that occur naturally and those that are products of atomic fission. The experimental study of radioactive substances will be described in the second lecture, including the newer techniques, and health safeguards. The third lecture will be devoted to applications of radioactive substances, and will include a general survey of available "tracers" and the techniques of using them in tackling chemical problems. Admission will be by ticket only (10s. for the course), from Mr. H. C. Wordsall, hon. secretary, London section, O.C.C.A., c/o Plastanol, Ltd., Crabtree Manorway, Belvedere, Kent.

The Atomic Age

A series of six lectures by well-known speakers on "The Atomic Age" will be given on Tuesdays at 6 p.m. commencing October 26, at the Memorial Hall, Farringdon Street, E.C.4. The first speaker will be Prof. M. I. Oliphant, who will be followed by Prof. P. M. S. Blackett (Nov. 2); Prof. R. F. Harrod (Nov. 9); Lord Russell (Nov. 23); Mr. Lionel Curtis (Nov. 30) and Prof. D. Brogan (Dec. 7). The lectures are given under the auspices of the Sir Halley Stewart Trust and free reserved seats may be obtained on application to the secretary.

Plant Engineers' Conference

At the first annual conference of the Institution of Incorporated Plant Engineers, to be held at Cheltenham Spa on October 7, 8 and 9, in addition to technical discussions, there are to be speeches by leading industrial personalities. The principal speaker will be Sir Percy Mills, K.B.E., who will address the conference on the subject of "The Enlightenment of Industrial Management." Sir Percy is managing director of W. & T. Avery, Ltd., and vice-president of the Midland Advisory Council on Industrial Productivity. Other speakers will be Dr. E. S. Grumell, C.B.E., chairman of the Fuel Efficiency Committee of the Ministry of Fuel and Power; Major Egbert Cadbury, joint managing director of Cadbury Bros., Ltd., Bourneville, and J. S. Fry & Sons, Ltd., Somerdale, Bristol, director of Lloyds Bank, Ltd., and regional controller, Ministry of Fuel and Power South Western Region; and Mr. C. Lacy-Hulbert, production director of Tube Investments, Ltd. The chairman of the conference will be Mr. L. G. Northcroft, joint managing director of Spirax Manufacturing Co., Ltd., and Sarco Thermostats, Ltd., Cheltenham.

PERSONAL

(Continued from previous page)

MR. M. C. MACNULTY has joined the staff of Bamag, Ltd., chemical engineers, as head of their drying department. Problems connected with the drying of farm crops are one of Mr. MacNulty's special fields of experience.

Several distinguished British scientists were among those who assembled in Stockholm this week as guests of the Royal Swedish Academy of Science to commemorate the death just 100 years ago of Jöns Jakob Berzelius. They included SIR HAROLD HARTLEY, who addressed the academy on Wednesday, SIR IAN HEILBRON, who was a speaker at the memorial banquet on the previous evening, PROF. PHILIP BOWDEN and DR. KATHLEEN LONSDALE.

Obituary

MR. STANDLEY BELCHER, whose death is announced, was co-founder and managing director of the Birmingham firm of Standley Belcher & Mason, Ltd., scientific apparatus manufacturers and laboratory furnishers. He was well known throughout the chemical trades, having been associated with this interest for over half a century. He was instrumental in the development of scientific glassware in this country from the outbreak of hostilities in 1914, when he realised that essential war production could not be carried on without replacing supplies which, up to that time, had been regarded as principally a German monopoly. As a founder member of the British Laboratory Ware Association, Mr. Belcher's advice was often sought and regarded as invaluable by the trade and by the many distinguished medical and scientific people, by whom his loss is deplored.

Overseas News Items

Big S. African Fertiliser Project.—A factory covering 60 acres in the Transvaal to produce fertilisers by distillation of low-grade coal and nitrogen synthesis, is to be established early next year, states a Reuter message from South Africa, which estimates the constructional costs at about £4 million. The equipment, it is stated, will be provided by the European Chemigas organisation.

Uranium Miners in Saxony.—Bad working conditions, neglect of safety precautions and severe supervision by Russian overseers are reported to be the cause of increasing numbers of workers leaving the uranium mines in Saxony. The authorities have tightened up the regulations for travel into and out of the area which includes the Erzgebirge mining district.

Italian Overseas Trade.—Records of Italian imports and exports in the first half of this year indicate that the largest purchases by Italy of chemical and associated materials included cellulose (for textiles) 21,807 tons, mineral phosphates 349,243 tons, crude sodium nitrate 18,678 tons, solid bitumen and residues 5906 tons, and tar oils and derivatives 18,040 tons. Among the larger export items were zinc ore 1448 tons, mercury 405 tons and sulphur 70,955 tons.

Australian Sulphur-Extraction Scheme.—Mr. J. B. Chiffley, Australian Prime Minister, has announced that a proposal for a sulphur-extraction scheme at Mount Morgan's gold and copper mine, Queensland, which the promoters claim would save $4,000,000 annually, has been referred to the Mineral Resources Survey Department for examination. A *Reuter* report states that the plan was suggested by Mr. Julius Kruttschnitt, American-born chairman of Mount Isa Mines.

Denmark to Have Oil Refinery?—Plans for the construction of an oil refinery in Denmark, with an annual capacity of about 330,000 tons—equal to about one-third of the present total oil requirements of the country—are soon to be debated in the Danish Parliament, states the London *Petroleum Press Service*. A company is to be formed, with Government participation, with the Danish shipbuilding company of A. P. Moeller, Copenhagen, and the Köpparsbergs Berglas A/B, a Swedish concern, which runs a refinery at Göteborg, Sweden, as other main shareholders. Copenhagen or Nyborg are the most likely locations of the projected plant.

Fresh Oil Source in the M.E.?—The Syria Petroleum Company are reported to have discovered a "wide petroleum area" in North-East Syria. The Syrian Government is studying present Saudi Arabian and Persian oil agreements before granting a concession to the company.

$2 Hourly for Atomic Plant Workers.—Resulting from a new wages award conferring increases of from 5 to 24 cents per hour on U.S. atomic plant workers at Oak Ridge, Tennessee, employees in the largest section, the gaseous diffusion process plant, will earn on the average $1.59 (nearly 8s.) hourly and the highest paid ill receive $2.07.

Italian Pharmaceutical Costs.—The scale of inflation in Italy is reflected in the claim by Italian pharmaceutical manufacturers that the thirty-fold increase in permitted prices does not compensate for the steep rise in production costs. There are now some 800 manufacturing undertakings employing about 20,000 and stated to be capable of supplying nearly all domestic demand.

German Fuel Gas for Holland.—Germany is to sell to Holland 80-90 million cu. m. of fuel gas a year for at least ten years under a long-term contract. The Anglo-American Joint Export-Import Agency said the gas will be supplied by pipeline to the Netherlands State mines for use in manufacturing ammonia and supplying towns near the border.

Italy's Restored Aluminium Industry.—Italy's aluminium output is expected this year to equal the pre-war figure of approximately 30,000 metric tons, a quantity which will cover domestic needs and leave an export surplus. Bauxite is being imported chiefly from Yugoslavia and France and the finished goods are marketed in Latin America, the Near East, India and Australia.

Expanding Austrian Magnesite Industry.—According to Swiss Press reports, to intensify the utilisation of Austria's large-scale magnesite deposits, an agreement has been concluded between Alpine Mining Company, Mayrhofen, Tyrol, and the Austrian-American Magnesite Works, Radentheim, permitting the latter (which is active in Carinthia), to take over the works of the former company. A new electric furnace is reported to have been installed at the Zillertalalpe works. A second magnesite works is to be erected at Hochfilzen, in the Tyrol.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *— followed by the date of the Summary, but such total may have been reduced.)

PEAT FUEL & PRODUCTS, LTD., London, E.C. (M., 25/9/48.) August 20, £1000 debenture, to P. W. Meade-Newman, London; general charge.

ELECTRODE WELDING CO., LTD., London, N.W. (M., 25/9/48.) August 20, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. March 30, 1948.

NEW PROCESS WELDERS, LTD., London, S.W. (M., 25/9/48.) August 17, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£8150. December 31, 1946.

STRONTIUM PRODUCTS, LTD., Bristol, mining company. (M., 25/9/48.) August 16, charge, to Bristol Permanent Economic Building Society securing £6000 and any other money, etc.; charged on Newland House, Newland (Glos.). *Nil. May 10, 1948.

PEST CONTROL, LTD., Bourn (Cambs.). (M., 25/9/48.) August 23, £4500 and £2730 mortgages, to Coventry Permanent Economic Building Society; respectively charged on land and messuages known as Little Finchden, Leigh Green, Tenterden, and certain land adjoining and on Whitegates, Foxton. *£344,000. April 26, 1948.

Satisfactions

STEWART PLASTICS, LTD., London, S.W. (M.S., 25/9/48.) Satisfaction August 14, £2800, etc., registered May 15, 1946.

BRITISH ALLIED PRODUCTS, LTD. (formerly BRITISH ALLIED METALS, LTD.), London, W.C. (M.S., 25/9/48.) Satisfaction, August 18, of mortgage and charge registered June 30, 1947.

New Companies Registered

Durazone (Ireland), Ltd. (12,558).—Private company. Capital £1000. Manufacturers of chemicals, chemical compounds and chemical substances, etc. Subscribers: J. D. Kierman, 11 St. Stephen's Green, Dublin, V. Dillon.

Company News

The name of **Lantigen Laboratories (England), Ltd.**, Pinewood, College Ride, Bagshot, Surrey, has been changed to **Lantigen (England), Ltd.**, as from September 1, 1948.

The nominal capital of **Eaton Plastics, Ltd.**, 137 Regent Street, London, W.1, has been increased beyond the registered capital of £100 to £4900, in £7 7½ per cent redeemable cumulative shares.

Chemical and Allied Stocks and Shares

APART from strength of aircraft shares in the rearmament section, stock markets remained uncertain because of the belief that a critical stage has been reached in international affairs. British Funds, after earlier strength, lost a little ground, and leading industrials were generally slightly lower on balance, although movements in most cases did not exceed more than a few pence. Whereas buyers were holding off, there was little selling, and sentiment was helped by full details of the success achieved by the big Imperial Chemical issue. Including "excess" shares, shareholders in fact applied for nearly 21,000,000 shares, so that the offer of 10,093,023 shares at 40s. 6d. each was subscribed twice over. This is a remarkable achievement when it is remembered that the offer was made at a time when markets generally have been uncertain and dominated by international fears. It is, of course, an illustration of the faith of shareholders in the company.

It will be recalled that the directors of I.C.I. have expressed the view that the 10 per cent dividend basis should be maintained on the larger capital. Imperial Chemical have been firm at 44s. 9d. with the new shares (20s. paid) at 23s. 7½d. It is expected that allotment letters in respect of the new shares will be posted to shareholders over the week-end.

Monsanto Chemical 5s. ordinary have changed hands around 58s. 9d., Fisons were 59s. 6d., Albright & Wilson 28s. 9d., and Amber Chemical 9s. 6d., while Laporte Chemicals 5s. ordinary were 20s. 3d. British Glues 4s. units held their recent rise to 21s. and business up to 9s. 6d. was recorded in British Drug Houses 5s. shares. Elsewhere, Morgan Crucible were dealt in around 53s. 6d., Midland Tar Distillers marked 33s. 6d., Ilford were 26s. 6d., and Dufay Chromex 2s. shares again changed hands around par. British Oxygen at 98s. 9d., British Aluminium 47s. 6d., and Borax Con-

solidated at 61s. 6d. were well maintained. Amalgamated Metal have again been around 19s. 9d. Turner & Newall were 76s. 6d., United Molasses 47s. 3d., British Plaster Board 24s. 9d., and the units of the Distillers Co. 27s. 9d.

Iron and steels were inclined to strengthen on rearmament considerations, but the tendency has been to await the expected Nationalisation Bill. Guest Keen were 48s. 6d., Dorman Long 31s. 6d., Thomas & Baldwins 14s. 10½d., and United Steel 28s. 7½d. T. W. Ward have been firm at 60s. 9d. on expectations of good results, although it is realised that the total distribution is unlikely to be increased above last year's rate. Courtaulds have been steady at 38s. 9d. and awaiting the financial results, British Celanese changed hands around 20s. Elsewhere, textile shares generally were fairly well maintained.

Metal Box firmed up to 99s. 4½d., and Dunlop Rubber strengthened to 73s. 9d. Lever & Unilever eased to 49s. 6d., and in response to the full results and good balance-sheet position, Triplex Glass 10s. shares were 25s. 6d. after touching 26s. Staveley Coal were again good, further improving to 83s. 6d., the market view being that sooner or later there is likely to be a partial return of capital to shareholders or a special distribution of some kind arising from Doncaster Amalgamated's capital return, Staveley having a 40 per cent interest in the share capital of the latter company.

Boots Drug 5s. ordinary were 52s. 4½d., Sangers 30s. 1½d., but Beechams deferred eased to 18s. 6d. Oil shares have been inclined to recede on the Palestine developments. Anglo-Iranian were £7 15/16, Shell 75s., and Burmah Oil 61s. 3d.

Next Week's Events

WEDNESDAY, SEPTEMBER 29

North-Western Fuel Luncheon Club. The Engineer's Club, Albert Square, Manchester, 12 noon. Opening meeting of the fourth annual session.

British Association of Chemists (London Section). Gas Industry House, 1 Grosvenor Place, S.W.1, 7.0 p.m. Coal symposium. Principal speaker, Dr. D. T. A. Townend.

WEDNESDAY, SEPTEMBER 29 and THURSDAY, SEPTEMBER 30

Institute of Welding. Wednesday, Institution of Civil Engineers, Great George Street, London, S.W.1, 2.30 p.m. Thursday, Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, 10.30 a.m. Autumn meeting.

THURSDAY, SEPTEMBER 30

Oil & Colour Chemists' Association (London section). Lecture Theatre, The Royal Institution, 21 Albemarle Street, London, W.1, 6.30 p.m. Professor H. J. Emeléus: "The Impact of Radioactivity on Inorganic Chemistry—I, The Chemistry of Radioactive Substances."

FRIDAY, OCTOBER 1

National Smoke Abatement Society. Cheltenham. Annual conference.

SATURDAY, OCTOBER 2

Society of Public Analysts and Other Analytical Chemists. (North of England Section and Physical Methods Group). Stork Hotel, Queen Square, Liverpool, 1, 1.0 p.m. D. M. Smith: "Analysis of Rare Earth Oxides by Means of Emission Spectra"; J. A. C. McClelland: "Determination of the Rare Earths Using the Intermittent Arc"; N. T. Gridgeman: "The Chromatographic Estimation of Vitamin A in Whale Liver Oil."

Poland's Chemical and Metal Trading Groups

THE following are some of the centralised trading organisations in Poland announced by *The Board of Trade Journal* as being competent to engage in foreign trade, together with the chemical and other commodities in which they severally deal:—

Import and Export Central Agency for Chemicals and Chemical Apparatus, "Ciech," L.L.Co., *Warsaw*, Jasna 10. Import and export of dyestuffs, chemicals, products of the chemical industry and other industries related to it, as well as of apparatus and equipment for the chemical and pharmaceutical industry.

Central Iron and Steel Agency, *Katowice*, Ligonia 7. *Warsaw*, Aleja na Skarpie 21. Sale of iron and steel foundry products at home and abroad.

Combine of the Non-Ferrous Metals Industry, *Katowice*, Podgorna 4. Export of zinc and zinc products like zinc sheets, zinc white, red lead, gleit, and import of zinc and lead ores.

Central Agency for the Sale of Petroleum Products, *Warsaw*, Rakowiecka 39. Import and export of products of petroleum origin as well as ozokerite and mineral oil.

Vegetable Oils of Africa

Comparison of Annual and Perennial Crops

THE serious falling-off in recent years of oil supplies from Africa, down to about half pre-war level, is considered by Prof. H. Varon (*Oleagineux*, 1948, *3*, Aug.-Sept., pp. 373-378) who makes interesting comparison with the December, 1947, issue of the *Inventaire Economique de L'Europe* in which total world production of vegetable oil in 1938, based on data of the International Food Council and other sources was given as 18-19 million tons, of which Africa's contribution was about 1 million tons. In making his review of the decline of African supplies Prof. Varon distinguishes between the annual crops, like groundnuts and cotton, and the perennial tree crops, such as those of the oil-palm and coconut, also the olive. The last-named and still more the oil-palm have maintained their productivity practically up to pre-war standards during the past few years.

While palm kernels, it is true, suffered some decline from 670,000 tons average for 1934-38 to 490,000 tons in 1945, this has been compensated by increased yields of palm oil, at least to some extent, especially in the Belgian Congo. But this has not greatly affected the world position, for which total output was down to 15.8 million tons in 1946, while world population has increased to 2300 million, requiring a further 105 million tons of fats—if they could be had. The difficulties which have operated to prevent realisation of increased supplies from Africa, including the persistent dryness which has depreciated the olive crop in the north, are considered by the professor, who also discussess the French and British plans for extended groundnut cultivation.

Comparison with Groundnuts

This latter development has to face certain features peculiar, more or less, to Africa, such as relatively poor soil, lack of labour, risk of soil erosion, etc Against such conditions the oil-palm offers greater resistivity and promise than annual cultivated crops, but of course requires longer time to show any considerable increase, so far as plantations are concerned. It is also less adapted than the groundnut to meet conditions of over-production of oils and fats—if ever such return. This point, however, has been kept in mind in the British groundnut schemes.

The general conclusion would seem to be that the two crops—groundnuts and oil-palm products—are in some degree complementary; the former being a relatiyely short term proposition is better adapted to meet fluctuations in demand.

From the French point of view, while modern large-scale European plantations, after the Belgian Congo pattern, are highly desirable, the chief practical problem is that of increasing output from indigenous forests and small native plantations on a family scale.

Eastern Competition

Such cultivations should be put in a position to meet the competition of Asiatic producers with their generally more fertile soil, more abundant labour, and often better mechanisation and transport. A further point noted is the comparative healthiness of climate, especially in hot humid districts, and reference is made to what are described as the remarkable researches of P. Gourou. These showed that the salubrity of inter-tropical countries is a resultant largely of rational cultivation (as illustrated by rice culture in the Far East) and would require a density of population which, in the forest areas of Africa, could only be achieved by concentration in favoured districts, to be gradually extended.

It goes beyond the scope of a technical journal to consider broadly all the social and economic factors, *e.g.*, native community structure, etc., which have a bearing on agricultural and forest production in Africa; but the main problem appears to be how best to combine native development of the right type—if this can be known and defined—with European aid.

One means now being adopted by the French is the provision of oil-mills in suitable localities to assist the natives in realising their oilseed and nut crops. This is described in another paper by G. Bourlet (*Oliagineux*, 1948, *3*, Aug.-Sept., pp. 363-372).

GERMAN PATENTS

THE second draft of a Bill relating to the liquidation of enemy property, including patents, was published in Belgium last month. (The first draft had been rejected last year by the Chamber of Deputies.) The new draft refers only to German property, and recommends that German patent and trade mark rights, which have not yet been declared to the authorities, shall become null and void three months after the passage of the Bill. Those in charge of the drafting hope thus to gain a complete list of all German patents and trade marks applied in Belgium.

Prices of British Chemical Products

AN active demand characterises most sections of the industrial chemicals market and the volume of inquiry both for home and export account has been fairly sustained during the past week. No important price adjustments have been reported and quotations generally are steady, with a firm undertone. The soda products continue in good request, with delivery specifications under existing contracts covering good quantities, and, as in other sections of the market, a certain amount of replacement buying has been in progress. Firm price conditions apply to the potash chemicals, offers of which find ready buyers. No further change in the quotations for the red and white leads is reported and the call for supplies is fully maintained. Business in the coal tar products market remains steady.

MANCHESTER.—Steady to firm price conditions continue to be reported in pretty well all sections of the Manchester chemical market, although actual movements, compared with recent weeks, have been few. The past few days have witnessed a steady home and export inquiry covering a wide range of light and heavy chemicals and new business has been on a fair scale, especially in the alkali products. The textile and allied industries and other leading home users are pressing for deliveries against orders already placed, and in a good many sections supplies still tend to be barely equal to current needs. Business in the fertiliser market has been on quietly steady lines, the phosphatic and potash-containing materials especially being wanted. A brisk demand for most tar products is also reported.

GLASGOW.—During the past week business in the Scottish chemical market has shown signs of improvement, a fair volume of orders having been received. Prices on the whole have remained steady. The export market continues to show signs of improvement; inquiries received covering a wide range of chemicals, and quite a few orders have been booked.

Price Changes

Rises: Alum, ammonium carbonate, lead, carbonate, sodium sulphate (salt cake), pitch, pyridine.

Reductions: Lactic acid, red lead, white lead, sodium nitrite.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £64; 80% pure, 1 ton, £66; commercial glacial 1 ton £79; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetic Anhydride.—Ton lots, d/d, 11¾d. per lb.

Acetone.—Maximum prices per ton, 1/5 tons, £76 10s.; single drums, £77 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 7⅛d. per proof gallon; 5000 gal. lots, d/d, 2s. 10⅛d. per proof gal.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate. — MANCHESTER: £46 per ton d/d.

Ammonium Carbonate.—£48 per ton d/d in 5-cwt. casks. MANCHESTER: Powder, £50 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Antimony Oxide.—£162 10s. per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 5-ton lots, £26/27 per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 10s. per ton in casks.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£29 per ton, d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5½d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 6s. 7d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 8d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 8d. per lb.

Copper Sulphate.—£42 10s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., from 157s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £115 per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g., 123/1 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £70 per ton; dark tech., £60 per ton ex works; barrels returnable.

Lead Acetate.—White, 110s. to 115s. per cwt., according to quantity.

Lead Carbonate.—British dry, ton lots, d/d. £116 10s. per ton.

Lead Nitrate.—About £115 per ton d/d in casks. MANCHESTER: £115.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £106; orange lead, £118. Ground in oil: red, £130 10s., orange, £142 10s. Ready-mixed lead paint: red, £138 5s.; orange, £150 5s. (subject to increase of £1 10s. per ton).

Lead, White.—Dry English, in 8-cwt. casks, £116 10s. per ton. Ground in oil, English, in 5-cwt. casks, £139 10s. per ton.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£103 10s. to £106 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 5s.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d. £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt. lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 10d. per gal.; pyridinised 64° O.P. 100 gal., 4s. 11d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton;

B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9¾d. per lb.; ground, 10¾d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s. 1d. per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £19 15s. per ton.

Sodium Nitrite.—£28-29 per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 5s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £23 per ton, d/d, in drums; broken, £23 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 12s. 6d. to £16 17s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 10s. 2d. to £7 10s. 2d. per ton; 140° Tw., arsenic-free, £5 2s. 6d. per ton; 140° Tw., arsenious, £4 15s. per ton. Quotations naked at sellers' works.

Tin Oxide.—1-cwt. lots d/d £25 10s.

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags), £97 per ton.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £75 10s.; green seal, £74 10s.; red seal, £73.

Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£50 10s. to £53 10s. per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £33 12s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Not quoted—temporarily unobtainable.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in January, £10 5s., rising by 1s. 6d. per ton per month to March, 1948.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 3s. 6d. to 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0¼d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £8 5s. to £9 5s. per ton f.o.b. suppliers' port. MANCHESTER: 100s. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 17s. 6d. to 21s. per gal.

Toluol.—Pure, 3s. 2½d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2½d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: September 22.—For the period ending September 25, 1948 (October 9, 1948, for refined oils). Per ton, naked, ex mill, works or refinery, and subject to additional charges according to package; LINSEED OIL, crude, £200. RAPESEED OIL, crude, £190. COCONUT OIL, crude, £106 refined deodorised, £112 refined hardened deodorised, £116. PALM KERNEL OIL, crude, £105 10s., refined deodorised, £112; refined hardened deodorised, £116. PALM OIL (per ton c.i.f.), in returnable casks, £99 5s.; in drums on loan, £98 15s., in bulk, £97 15s. GROUNDNUT OIL, crude, £110 10s.; refined deodorised, £114, refined hardened deodorised, 40 deg. £118. WHALE OIL, refined hardened, 42 deg., £117; refined hardened, 46/48 deg., £118. ACID OILS, Groundnut, £94; soya, £92; coconut and palm-kernel, £97 10s. ROSIN: Wood, 40s. 6d. to 48s.; gum, 56s. to 62s. 6d. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

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Phenyl Mercury Compounds—Trade Name **"MERSOLITE"**

Phenyl Mercury Acetate	-	**Mersolite 8**
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Phenyl Mercury Chloride	-	**Mersolite 2**
Phenyl Mercury Hydroxide	-	**Mersolite 1**
Phenyl Mercury Nitrate	-	**Mersolite 7**

These compounds are now being manufactured by us. We are also willing to consider the manufacture of other compounds for which there may be a demand.

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Works: Abbey Mills Chemical Works, Stratford, E.15

Oil from Rubber Seeds

Disappointing Results of Ceylon Experiments

THE prevailing world scarcity of vegetable oils and their high prices gave rise recently to consideration of the possibility of collecting and marketing rubber seeds in Ceylon. A circular was issued inviting rubber estates to make experimental collections during the 1947 seed season with a view to determining the probable cost per ton under Ceylon estate conditions.

At the same time, two oil milling concerns agreed to make expression trials on a sufficiently large scale to determine the commercial possibility of expression of oil in Ceylon. The seed season of 1947 was, however, a complete failure, says the report of the Ceylon Rubber Research Board for 1947, just issued. This was because there was a most severe attack of *Phytophthora* pod disease for many years, and it was quite impossible for reliable information on collection costs to be obtained.

The two oil mills, however, did with some difficulty obtain sufficient seed for small scale trials, which were in both cases disappointing, particularly with regard to the percentage of free fatty acids, which was unduly high, indicating that in spite of the fact that the seeds were heated immediately on receipt by the oil millers, enzyme activity had been too great between seed fall and expression.

These meagre results are sufficient to indicate, however, that in Ceylon the total available amount of seed must always be expected to be very much less per acre than in Malaya, where *Oidium* attack on the flowers and *Phytophthora* attack on the seed pods is almost negligible by comparison, and that if oil of satisfactory commercial quantity is to be obtained lypolytic enzyme activity must be at a minimum. This presupposes rapid collection and sterilisation of seed before extraction of oil commences.

Oil in North Mexico.—What is believed to be a major oilfield has recently been discovered near Reynosa, in Northern Mexico, near the U.S. frontier. This is stated to be the first time that oil had been struck in this area. Plans are being made for the construction of a pipeline from Reynosa to Monterey. Oil from this area is to be reserved for export only (*Petroleum Press Service*).

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Application forms (returnable 1st December, 1948) and particulars of the Associate-Membership Examination for 1949 may be obtained from the HON. REGISTRAR, Institution of Chemical Engineers, 56, Victoria Street, Westminster, London, S.W.1.

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

ASSISTANT Engineer required by chemical engineering firm in London. Qualifications required are: Age about 30; B.Sc. Engineering; above average knowledge of Physics and Thermodynamics essential; good mathematics; understanding of chemistry desirable; practical works experience essential; understanding of general office procedure and technical sales an advantage. The position offers excellent opportunities to a man having these qualifications coupled with a keen business outlook. Write, stating age, qualifications, salary required, to Box No. 2699, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMIST with interest in chemical engineering required on the laboratory staff of a large firm of chemical manufacturers, for pilot-plant development work. The position offers good prospects. Pension scheme in operation. Apply with full particulars of qualifications and salary required to Box No. 2708, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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TECHNICAL Sales Engineer required by well-known firm of chemical engineers in London. Work involves following-up by personal interview tenders made for a wide variety of plant; discussion of new projects with clients and all activities required to obtain orders for chemical plant. Qualifications required: (1) Good training in Engineering; (2) practical experience in chemical works an advantage; (3) real understanding of principles of Chemical Engineering unit process; (4) good personality; (5) an enthusiasm for hard work and getting orders. No commissions paid. Not essential to live in London. Write, stating age, previous experience and salary required, to Box No. 2698, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WORKS Chemist wanted for factories manufacturing dyestuffs and organic chemicals. Candidates should have first or second class Honours degree. Works experience useful but not essential. Salary in accordance with qualifications and experience. Applications should be made in writing to the Staff Department, Imperial Chemical Industries Limited, Dyestuffs Division, Hexagon House, Blackley, Manchester, 9. Reference W.1.

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ARTOFEX Dough Mixer; 15 ft. Bucket Elevator; Jacketed Filter Press; Jacketed Heavy Dough Mixer, 300 lb.; Four Roll Granite Refiner; 6 Roll Steel Refiner.

HARRY H. GARDAM & CO. LTD., STAINES.

BELT Driven Elevator, steel cased, 2 ft. by 1 ft. by 16 ft. long, 14 ft. centres, 6 in. belt steel buckets 5 in. by 4 in. by 3½ in. by 12 in. centres feed hopper, fast pulley. Price £75. THOMPSON & SON (MILLWALL) LTD., 60 Hatcham Road, Ilderton Road, S.E.15. Phone: East 1844.

CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Beehurch, London." Telephone: 3285 East.

DISINFECTORS Two 8 ft. by 5 ft. diam. jacketed Four 7 ft. by 3 ft. diam. with coils, Two Oval 50 in. by 30 in. by 7 ft. jacketed. New condition. THOMPSON & SON (MILLWALL) LTD., Cuba Street, London, E.14. Tel. East 1844.

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ONE Twin Roll **DRIER** by N. V. Goudche of Gouda, Holland ; steam-heated rolls, 3 ft. 11 in. long by 1 ft. 10 in. diam., driven through enclosed gears by 6 h.p. 440/3/50 cycles electric motor, complete with starter. Capacity, 60 gallons.

One—Double-tube **ROTARY DRIER** by Vickers-Armstrong, 52 ft. long by 7 ft. 6 in. diam (int. tube, approx. 3 ft. 6 in. diam.) ; outer shell, ⅜ in. riveted steel plate with internally bolted flights ; drive by 50 h.p. Brook totally enclosed slip-ring motor, 440/3/50, through David Brown Radicon Reduction gearbox, 50 h.p. Complete with brick furnace, approx. 16 ft. long by 10 ft. by 10 ft., and Babcock & Wilcox chain-grate stoker, 54 in.

One—Horizontal 2-stage **VACUUM PUMP** by Pearn, size 8 in. by 6 in. by 4 in. Displacement approx. 80 cu.ft. per minute ; 24 in. by 3 in. fast and loose pulley drive fitted belt striking gear.

Several—2,000- and 3,000-litre **EARTHENWARE VESSELS,** open top, fitted with loose-fitting domed cover, having 8 in. centre hole with loose lid and two 2 in. inlets, one 1½ in. bottom side outlet.

One—24 in. diam. Overdriven **HYDRO EXTRACTOR** by Broadbent. Vulcanite-lined basked and Monitor case. Basket perforations, ¼ in. diam. ; basket, 19 in. deep. Drive by fast and loose pulleys, 8 in. diam. by 3½ in. face with jockey pulley.

One—Horizontal Twin " Z "-bladed **MIXER** by Grasso. Trough, 20 in. by 20 in. by 20 in. deep. Arranged for hand tilting through chain and counter-balance weights. V-rope pulley drive through machine-cut gears.

One—Multi-tubular **AIR COOLER,** brine type, size 2 ft. 7 in. long by 2 ft. 3 in. by 2 ft. 3 in. Outer casing constructed from ¼ in. mild steel plate. Brine inlet and outlet size 1 ¼ in.

One—Vertical **MIXER** by Brierley, Collier & Hartley, with stainless steel lined hemispherical pan, 18 in. diam. by 10 in. deep ; jacketed for 15 lb. per sq. in. working pressure. No outlet. Vertical stainless steel spiral type agitator overdriven through gearing by 12 in. diam. by 2½ in. face fast and loose pulleys.

Two—Steam Jacketed **ROTARY VACUUM DRIERS,** each 17 ft. 3 in. long by 4 ft. 6 in. diam. Manhole in barrel with cover, mounted on roller tracks. Driven through glanded trunnion bearings, discharge is effected through steam jacketed discharge chamber.

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Drum cell type. 4 ft. 7½ in. diameter × 2 ft. 7½ in. wide. Filter surface 35 sq. ft. 2 h.p. 4-speed motor with starter. Makers, International Combustion Co, Ltd. Brand new condition £1,350

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FOUR—New 40-gal. Steam Jacketed Vertical Open-top Mixers, 2 ft. diam. by 2 ft. deep, 50 lb. per sq. in. w.p.; overdriven stirring gear

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STAINLESS STEEL COIL HEATED VESSEL, 350 gall. capacity, 3 ft. dia. by 8 ft. deep with 9 turns 1½ in. bore stainless steel coil. Mounted on three mild steel channel legs and vessel, complete with bolted-on cover, usual connections and sampling cocks.

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DITTO of 60 gall., capacity with aluminium pan and jacket.

ONE TON RECTANGULAR STAINLESS STEEL TRANSPORTABLE TANKS, 6 ft. by 3 ft. 6 in. by 2 ft. deep, mounted on mild steel chassis fitted with four bogy wheels.

100 GALL. UNDERDRIVEN STAINLESS STEEL MIXER, 2 ft. 6 in. dia. by 3 ft. 3 in. deep, with flanged outlet. Mounted on mild steel transportable stand and complete with bolted-on cover fitted with charging hole.

100 GALL. CAPACITY STAINLESS STEEL STORAGE TANKS, approx. 2 ft. 11 in. dia. by 2 ft. 11 in. deep, fitted with sloping bases and 1 in. B.S.P. screwed outlets.

20 GALL. CYLINDRICAL STAINLESS STEEL CONTAINERS, 15½ in. dia. by 31 in. deep, with lids and carrying handles and fitted with ¾ in. bore outlets.

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One Open Top Low Pressure steam or hot water JACKETED MIXER, oval shape, 4 ft. 6 in. by 3 ft. 6 in. by 3 ft. deep, mild steel riveted construction with outer jacket. 2½ in. bottom run off, fitted with treacle type valve, also with two sets of paddle type agitators, intermeshing and driven through bevel wheel and pinion from chain sprocket, fitted with 2-piece hinged cover.

One WERNER PFLEIDERER HORIZONTAL BOTTOM JACKETED MIXER, 2 ft 4 in. by 2 ft. 4 in. by 2 ft. deep, having heavy double fin type blades, non-glanded; arranged for tilting, driven by fast, loose and reversing pulleys with hand clutch. Available inspection our works.

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TWO No. 7 Atlas steam-jacketed Ribbon Mixing Machines by G. Porteus Ltd., Leeds, complete with Radicon reduction gear, 15 h.p. T.E. 400/3/50 motor and Star-Delta starter, as new. M.W.F., LTD., Fletcher Street, Stockport 2456.

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TWO—**STEAM JACKETED U-SHAPED MIXERS** by Porteous, each 8 ft. long by 2 ft. 10 in. wide by 3 ft. 4 in. deep. Ribbon type mixing blades. B.B. complete with gearing, red. gear and 15 h.p. totally enclosed motor, 400/3/50. Ellison starter. Excellent condition.

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